About This Guide

This section discusses the objectives, audience, organization, and conventions of the *Cisco 2524 and Cisco 2525 Router User Guide*.

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Document Objectives

This publication will step you through initial site preparation, installation, configuration, and troubleshooting of the Cisco 2524 and Cisco 2525 routers. It also covers selected maintenance procedures.

Audience

This publication is designed for the person installing the router, who should be familiar with electronic circuitry and wiring practices and have experience as an electronic or electromechanical technician.

For more advanced configurations, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications for Cisco Internetwork Operating System (Cisco IOS) Release 11.0 and earlier releases. Refer to the *Configuration Fundamentals Configuration Guide* and *Configuration Fundamentals Command Reference* publications for Cisco IOS Release 11.1 and later releases.

Document Organization

The major sections of this user guide are as follows:

- Chapter 1, “Overview of the Cisco 2524 and Cisco 2525 Routers,” discusses the features and specifications of the routers.
- Chapter 2, “Preparing to Install the Cisco 2524 and Cisco 2525 Routers,” discusses environmental requirements and preparation for network connections, and describes the various ports and how to prepare for connections between networks and ports.
- Chapter 3, “Installing the Cisco 2524 and Cisco 2525 Routers,” includes basic installation information and discusses making connections to your LAN, WAN, console terminal, and modem.
- Chapter 4, “Configuring the Cisco 2524 and Cisco 2525 Routers,” discusses how to configure the routers using configuration mode, AutoInstall, or the prompt-driven System Configuration Dialog.
- Appendix A, “Maintaining the Cisco 2524 and Cisco 2525 Routers,” discusses maintenance procedures, including installing WAN modules, upgrading the boot Flash memory, upgrading the DRAM SIMM, replacing the system-code SIMMs, recovering lost passwords, changing the virtual configuration register settings, and copying a new system image to Flash memory.
- Appendix B, “Troubleshooting the Cisco 2524 and Cisco 2525 Routers,” provides troubleshooting procedures for the routers, such as reading the LEDs and running diagnostic tests.
- Appendix C, “Cabling Specifications for the Cisco 2524 and Cisco 2525 Routers,” provides pinouts for the router ports and cables.
- Appendix D, “Translated Safety Warnings,” contains translations in multiple languages of the warnings that appear in this manual.

Document Conventions

This publication uses the following conventions to convey instructions and information.

Command descriptions use these conventions:

- Commands and keywords are in **boldface** font.
- Variables for which you supply values are in *italic* font.
- Elements in square brackets ([ ]) are optional.
- Alternative but required keywords are grouped in braces ({ }) and are separated by vertical bars (|).

Examples use these conventions:

- Terminal sessions and information the system displays are in `screen` font.
- Information you enter is in **`boldface screen`** font.
- Nonprinting characters are in angle brackets (< >).
- Default responses to system prompts are in square brackets ([ ]).

Note Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.

Timesaver Means *the described action saves time*. You can save time by performing the action described in the paragraph.

Caution Means r*eader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Warning This warning symbol means *danger*. You are in a situation that could cause bodily injury. Before you work on any equipment, you must be aware of the hazards involved with electrical circuitry and familiar with standard practices for preventing accidents. (To see translated versions of this warning, refer to the appendix “Translated Safety Warnings.”)

CHAPTER 1

Overview of the Cisco 2524 and Cisco 2525 Routers

The Cisco 2524 and Cisco 2525 routers provide LAN and WAN access in a low-cost modular router platform that can grow with your internetworking needs. The Cisco 2524 offers an Ethernet (attachment unit interface [AUI] or 10BaseT) LAN connection, and the Cisco 2525 offers a Token Ring (shielded twisted-pair [STP] or unshielded twisted-pair [UTP]) LAN connection. Both routers can accommodate up to three WAN modules—two synchronous serial and one Integrated Services Digital Network (ISDN).

The choice of synchronous serial WAN modules is as follows:

- 2-wire switched 56-kbps data service unit/channel service unit (DSU/CSU)
- 4-wire 56/64-kbps DSU/CSU
- Fractional T1/T1 DSU/CSU
- Five-in-one synchronous serial

Note The five-in-one synchronous serial WAN module gets its name from the five types of signaling it supports: EIA/TIA-232, EIA/TIA-449, V.35, X.21, and EIA-530. You can order from Cisco Systems a DB-60 shielded serial transition cable. The router end of the shielded serial transition cable has a DB-60 connector; the other end of the cable has the appropriate connector for the standard interface you specify.

The choice of ISDN WAN modules is as follows:

- ISDN Basic Rate Interface (BRI)
- ISDN with integrated network termination 1 (NT1) device

The ISDN WAN modules are designed so that you cannot insert them into the synchronous serial WAN slots. A blank slot cover is installed over unused slots.

Features

The Cisco 2524 and Cisco 2525 routers include the following features:

- Three slots for WAN modules
- One Ethernet (AUI or 10BaseT) interface on the Cisco 2524 router
- One Token Ring (STP or UTP) interface on the Cisco 2525 router
- Dynamic random-access memory (DRAM) for main system memory and shared memory
- Nonvolatile random-access memory (NVRAM) for storing configuration information
- Flash memory for running Cisco IOS software
- EIA/TIA-232 console port for connecting a console terminal
- EIA/TIA-232 auxiliary port for connecting a terminal or modem

Note EIA/TIA-232 and EIA/TIA-449 were known as recommended standards RS-232 and RS-449 before their acceptance as standards by the Electronic Industries Association (EIA) and Telecommunications Industry Association (TIA).

Figure 1-1 shows the front panel, which is the same for both routers.

Figure 1-1 Cisco 2524 and Cisco 2525 Front Panel

Figure 1-2 shows the rear panel of the Cisco 2524 router, and Figure 1-3 shows the rear panel of the Cisco 2525 router.

Figure 1-2 Cisco 2524 Rear Panel

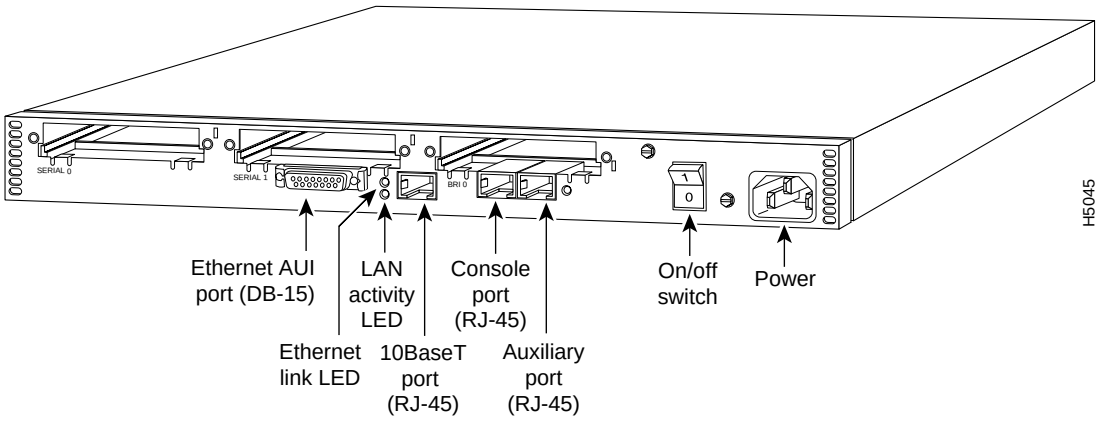


Figure 1-3 Cisco 2525 Rear Panel

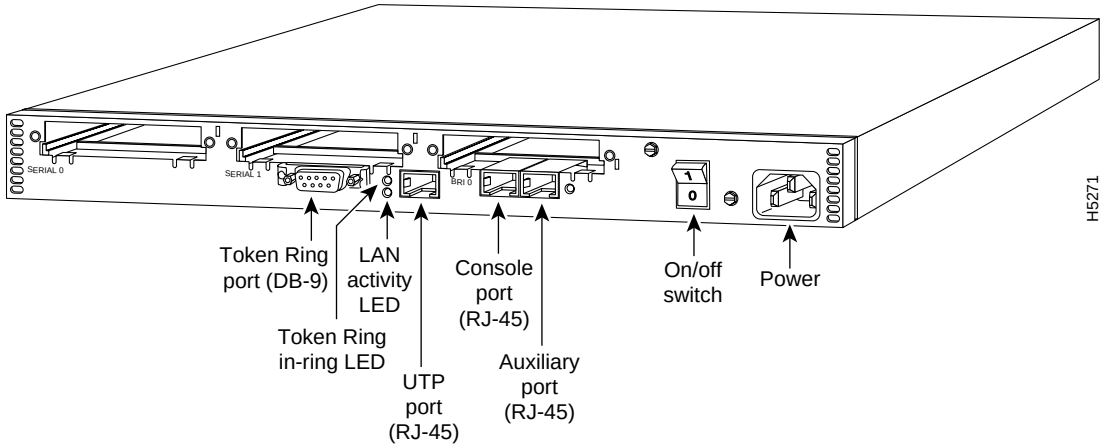


Figure 1-4 through Figure 1-9 show the WAN modules. Figure 1-10 shows the blank slot cover.

Figure 1-4 2-Wire Switched 56-kbps DSU/CSU WAN Module

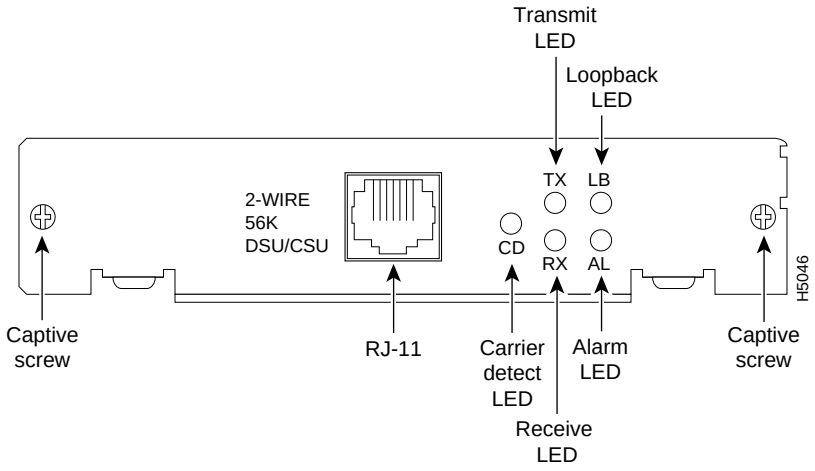


Figure 1-5 4-Wire 56/64-kbps DSU/CSU WAN Module

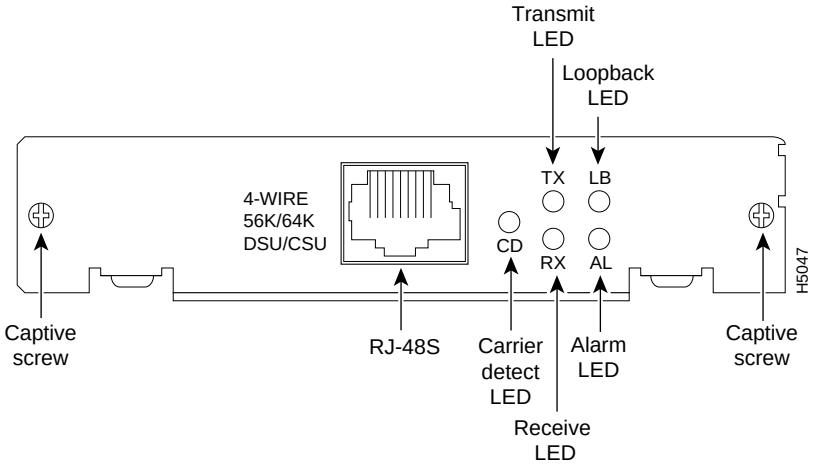


Figure 1-6 Fractional T1/T1 DSU/CSU WAN Module

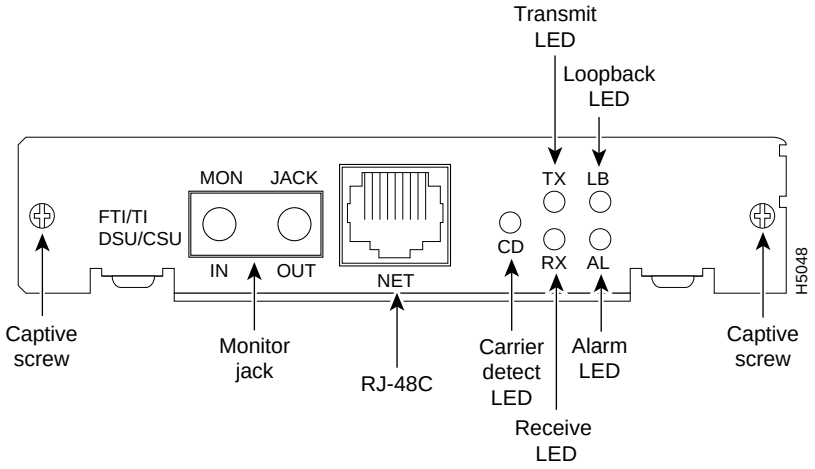


Figure 1-7 Five-in-One Synchronous Serial WAN Module

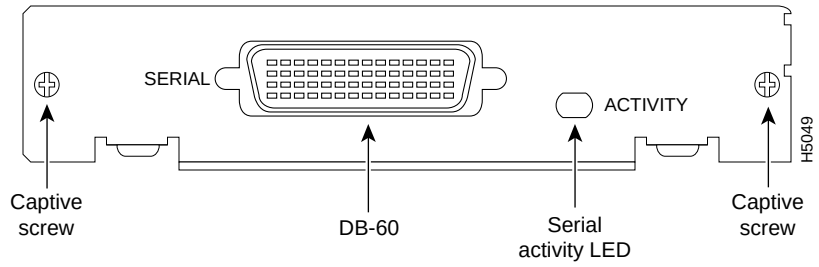


Figure 1-8 ISDN BRI WAN Module

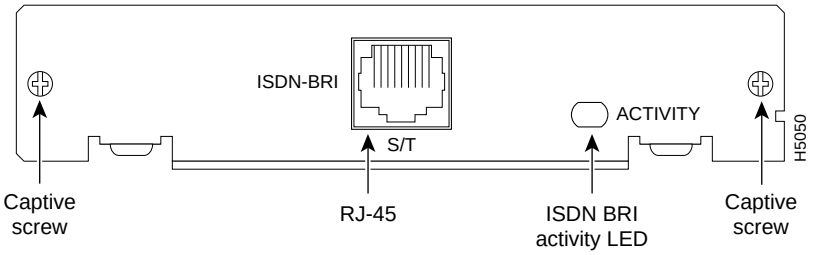


Figure 1-9 ISDN BRI with Integrated NT1 WAN Module

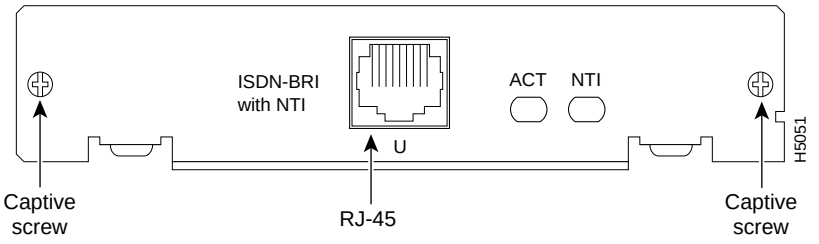
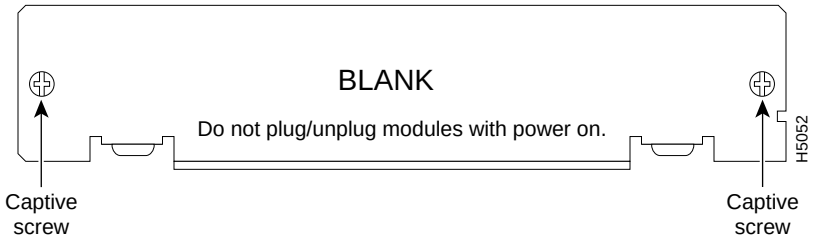


Figure 1-10 Blank Slot Cover



Specifications

The specifications of the Cisco 2524 and Cisco 2525 routers are listed in Table 1-1.

Table 1-1 System Specifications

Description	Specification
Dimensions (H x W x D)	1.75 x 17.5 x 10.56" one rack unit (4.44 x 44.45 x 26.82 cm)
Weight	10 lb (4.5 kg)
Input voltage, AC power supply Current Frequency Power dissipation	100–240 VAC[1] 1.2–0.6A 50–60 Hz 40W (maximum), 135.5 Btus[2]/hr
Input voltage, DC power supply Current Power dissipation	40W, 40–72 VDC[3] 1.5–1.0A 40W (maximum), 135.5 Btus/hr
Processor	20-MHz Motorola 68EC030

Description	Specification
WAN interface options	• 2-wire switched 56-kbps DSU/CSU (RJ-11) • 4-wire 56/64-DSU/CSU (RJ-48S) • Fractional T1/T1 DSU/CSU (RJ-48C) • Five-in-one synchronous serial (DB-60) • ISDN BRI (RJ-45) • ISDN BRI with integrated NT1 (RJ-45)
LAN interface options	Cisco 2524: Ethernet AUI (DB-15) or 10BaseT (RJ-45) Cisco 2525: Token Ring STP (DB-9) or UTP (RJ-45)
Synchronous serial interfaces (five-in-one synchronous serial WAN module)	• EIA/TIA-232, EIA/TIA-449, V.35, X.21 (NRZ/NRZI[4] and DTE/DCE[5] mode) • EIA-530 (NRZ/NRZI and DTE mode) • The five-in-one synchronous serial interface uses the DB-60 connector at the chassis
Console and auxiliary ports	Asynchronous serial (RJ-45)
Operating environment	32–104°F (0–40°C)
Nonoperating temperature	–40–185°F (–40–85°C)
Operating humidity	5–95%, noncondensing
Noise level	34 dB[6] @ 3' (0.914 m)
Regulatory compliance	• 2-wire switched 56-kbps DSU/CSU module: FCC Class A, Part 15 • 4-wire 56/64-kbps DSU/CSU module: FCC Class A, Part 15 and FCC Part 68 • Fractional T1/T1 DSU/CSU module: FCC Class A, Part 15 and FCC Part 68

1. VAC = volts alternating current.
2. BTU = British thermal unit.
3. VDC = volts direct current.
4. NRZ = nonreturn to zero; NRZI = nonreturn to zero inverted.
5. DTE = data terminal equipment; DCE = data communications equipment.
6. dB = decibels.

FCC Part 68

The following text is required for FCC Part 68 regulatory compliance:

The equipment complies with Part 68 of the FCC rules. On the bottom of the equipment is a label that shows the FCC registration number.

If the equipment causes harm to the telephone network, the telephone company may temporarily discontinue service. If possible, advance notification is given; otherwise, notification is given as soon as possible. The telephone company will advise the customer of the right to file a complaint with the FCC.

The telephone company may make changes in its facility, equipment, operations, or procedures that could affect the proper operation of the equipment; advance notification and the opportunity to maintain uninterrupted service will be given.

If you experience difficulty with the Cisco 2524 or Cisco 2525 router, please contact Cisco Systems at 800 553-NETS (6387) or 408 526-4000 for repair and warranty information. If your equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

The module contains no user-serviceable parts.

An FCC-compliant telephone cord and a modular plug is provided with the equipment. The equipment is designed to be connected to the telephone network or premises wiring using an FCC-compatible modular jack that is Part 68 compliant.

Table 1-2 lists information that may be required when applying to the local telephone company for leased-line facilities.

Table 1-2 Information About Leased-Line Facilities

Module Type	Service Type	Digital Facility Interface Code	Service Order Code	Network Jack
4-Wire 56/64-kbps DSU/CSU WAN Module	2.4-kbps digital interface	04DU5-24	6.0F	RJ-48S
	4.8-kbps digital interface	04DU5-48	6.0F	RJ-48S
	9.6-kbps digital interface	04DU5-96	6.0F	RJ-48S
	19.2-kbps digital interface	04DU5-19	6.0F	RJ-48S
	38.4-kbps digital interface	04DU5-38	6.0F	RJ-48S
	56-kbps digital interface	04DU5-56	6.0F	RJ-48S
	64-kbps digital interface	04DU5-64	6.0F	RJ-48S
Fractional T1/T1 DSU/CSU WAN Module	1.544-Mbps digital interface	04DU9-ISN	6.0N	RJ-48C

CHAPTER 2

Preparing to Install the Cisco 2524 and Cisco 2525 Routers

This chapter describes the tasks you must perform before you begin to install the Cisco 2524 and Cisco 2525 routers, and includes the following sections:

- Safety Recommendations
- General Site Requirements
- Installation Checklist
- Creating a Site Log
- Preparing to Connect to a Network
- Inspecting the System

Safety Recommendations

Follow these guidelines to ensure general safety:

- Keep the chassis area clear and dust-free during and after installation.
- Put the removed chassis cover in a safe place.
- Keep tools away from walk areas where you and others could fall over them.
- Do not wear loose clothing that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- Wear safety glasses if you are working under any conditions that might be hazardous to your eyes.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.

Warning Ultimate disposal of this product should be handled according to all national laws and regulations. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Maintaining Safety with Electricity

Follow these guidelines when working on equipment powered by electricity.

Warning Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or can weld the metal object to the terminals. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

- Locate the emergency power-off switch for the room in which you are working. Then, if an electrical accident occurs, you can act quickly to turn off the power.
- Disconnect all power by turning off the power and unplugging the power cord before doing the following:
  - Installing or removing a chassis
  - Working near power supplies

Warning When installing the unit, the ground connection must always be made first and disconnected last. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is disconnected from a circuit. Always check.

Warning Read the installation instructions before you connect the system to its power source. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, frayed power cords, and missing safety grounds.
- If an electrical accident occurs, proceed as follows:
  - Use caution; do not become a victim yourself.
  - Turn off power to the system.
  - If possible, send another person to get medical aid. Otherwise, assess the condition of the victim and then call for help.
  - Determine if the person needs rescue breathing or external cardiac compressions; then take appropriate action.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. ESD damage occurs when electronic components are improperly handled and can result in complete or intermittent failures.

Always follow ESD-prevention procedures when removing and replacing components. Ensure that the chassis is electrically connected to earth ground. Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the grounding clip to an unpainted surface of the chassis frame to safely ground unwanted ESD voltages. To properly guard against ESD damage and shocks, the wrist strap and cord must operate effectively. If no wrist strap is available, ground yourself by touching the metal part of the chassis.

Caution For safety, periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms (Mohms).

General Site Requirements

This section describes the requirements your site must meet for safe installation and operation of your system. Ensure that your site is properly prepared before beginning installation.

Site Environment

The routers can be placed on a desktop or mounted in a rack or on a wall. The location of the routers and the layout of your equipment rack or wiring room are extremely important for proper system operation. Equipment placed too close together, inadequate ventilation, and inaccessible panels can cause system malfunctions and shutdowns, and can make router maintenance difficult.

When planning your site layout and equipment locations, keep in mind the precautions described in the next section, “Preventive Site Configuration,” to help avoid equipment failures and reduce the possibility of environmentally caused shutdowns. If you are currently experiencing shutdowns or unusually high errors with your existing equipment, these precautions may help you isolate the cause of failures and prevent future problems.

Preventive Site Configuration

The following precautions will help you plan an acceptable operating environment for your router and will help you avoid environmentally caused equipment failures:

- Electrical equipment generates heat. Ambient air temperature might not be adequate to cool equipment to acceptable operating temperatures without adequate circulation. Ensure that the room in which you operate your system has adequate air circulation.
- Always follow the ESD-prevention procedures described in the section “Safety Recommendations” earlier in this chapter to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.
- Ensure that the chassis cover is secure. The chassis is designed to allow cooling air to flow effectively within it. An open chassis allows air leaks, which may interrupt and redirect the flow of cooling air from internal components.

Configuring Equipment Racks

The following tips will help you plan an acceptable equipment rack configuration:

- Enclosed racks must have adequate ventilation. Ensure that the rack is not overly congested because each unit generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air.
- When mounting a chassis in an open rack, ensure that the rack frame does not block the intake or exhaust ports. If the chassis is installed on slides, check the position of the chassis when it is seated all the way into the rack.
- In an enclosed rack with a ventilation fan in the top, excessive heat generated by equipment near the bottom of the rack can be drawn upward and into the intake ports of the equipment above it in the rack. Ensure that you provide adequate ventilation for equipment at the bottom of the rack.
- Baffles can help to isolate exhaust air from intake air, which also helps to draw cooling air through the chassis. The best placement of the baffles depends on the airflow patterns in the rack, which are found by experimenting with different arrangements.

Power Supply Considerations

Check the power at your site to ensure that you are receiving "clean" power (free of spikes and noise). Install a power conditioner if necessary.

Warning The device is designed to work with TN power systems. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

The router's AC power supply includes the following features:

- Autoselects either 110V or 220V operation.
- All units include a 6-foot (1.8-meter) electrical power cord. (A label near the power cord indicates the correct voltage, frequency, current draw, and power dissipation for the unit.)

Warning This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A U.S. (240 VAC, 10A international) is used on the phase conductors (all current-carrying conductors). (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

The Cisco 2524 offers a direct current (DC) power supply. See the section "DC Power Specifications" in the chapter "Installing the Cisco 2524 and Cisco 2525 Routers" for more information.

Installation Checklist

The Installation Checklist lists the procedures for initial hardware installation of a new router. Make a copy of this checklist and mark the entries as you complete each procedure. Include a copy of the checklist for each system in your Site Log. (See the next section, "Creating a Site Log.")

Installation checklist for site_____

Router name_____

Task	Verified by	Date
Installation checklist copied		
Background information placed in Site Log		
Site power voltages verified		
Required tools available		
Additional equipment available		
Router received		
Optional UniverCD or printed documentation received		
Chassis components verified		
Initial electrical connections established		
ASCII terminal or PC attached to console port		
Signal distance limits verified		
Startup sequence steps completed		
Initial system operation verified		
Software image verified		

Creating a Site Log

The Site Log provides a record of all actions relevant to the router. Keep it near the chassis where anyone who installs or maintains the router has access to it. Use the Installation Checklist (see the previous section, "Installation Checklist") to verify steps in the installation and maintenance of your router. Site Log entries might include the following:

- Installation progress—Make a copy of the Installation Checklist and insert it into the Site Log. Make entries on the checklist as you complete each procedure.
- Upgrade and maintenance procedures—Use the Site Log as a record of ongoing system maintenance and expansion. Each time a procedure is performed on the router, update the Site Log to reflect the following:
  - Configuration changes
  - Changes and updates to Cisco IOS software
  - Maintenance schedules and requirements
  - Corrective maintenance procedures performed
  - Intermittent problems
  - Related comments and notes

Preparing to Connect to a Network

When setting up your router, consider distance limitations and potential electromagnetic interference (EMI) as defined by the EIA.

Warning The Ethernet 10BaseT, Token Ring, serial, console, and auxiliary ports contain safety extra-low voltage (SELV) circuits. BRI circuits are treated like telephone-network voltage (TNV) circuits. Avoid connecting SELV circuits to TNV circuits. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

2-Wire Switched 56-kbps DSU/CSU WAN Module

The 2-wire switched 56-kbps DSU/CSU WAN module includes an RJ-11 port for connection to a WAN. Cables are not included with the modules; however, port pinouts are listed in the section "Fractional T1/T1 DSU/CSU Module Port Pinouts" in the appendix "Cabling Specifications for the Cisco 2524 and Cisco 2525 Routers."

Warning Network hazardous voltages are present in the BRI, fractional T1/T1, and switched 56 cables. If you detach the cable, detach the end away from the router first to avoid possible electric shock. Network hazardous voltages are also present in the area of the BRI (RJ-45), fractional T1/T1 (RJ-48C), and switched 56 (RJ-11 or RJ-48S) ports, regardless of whether power is OFF or ON. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Warning This card is intended to be installed in UL- and CSA-certified equipment in the field by the user in the manufacturer's defined operator access area. Check the equipment manufacturer to verify/confirm that your equipment is suitable for user-installed application cards. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Table 2-2 lists network specifications to consider before connecting the module to a network.

Table 2-1 2-Wire Switched 56-kbps DSU/CSU WAN Module Network Specifications

Description	Specification
Loop rates	56 kbps
Data rates	56 kbps
Line requirements	Northern Telecom Datapath Technology, Bellcore TR-EOP-000277
Receiver sensitivity	–42 dB at 80 kHz[1]

1. kHz = kilohertz.

4-Wire 56/64-kbps DSU/CSU WAN Module

The 4-wire 56/64-kbps DSU/CSU WAN module includes an RJ-48S port for connection to a WAN. Cables are not included with the module; however, port pinouts are listed in the section "4-Wire 56/64-kbps DSU/CSU Module Port Pinouts" in the appendix "Cabling Specifications for the Cisco 2524 and Cisco 2525 Routers.

Warning Network hazardous voltages are present in the BRI, fractional T1/T1, and switched 56 cables. If you detach the cable, detach the end away from the router first to avoid possible electric shock. Network hazardous voltages are also present in the area of the BRI (RJ-45), fractional T1/T1 (RJ-48C), and switched 56 (RJ-11 or RJ-48S) ports, regardless of whether power is OFF or ON. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Warning This card is intended to be installed in UL- and CSA-certified equipment in the field by the user in the manufacturer's defined operator access area. Check the equipment manufacturer to verify/confirm that your equipment is suitable for user-installed application cards. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Table 2-2 lists network specifications to consider before connecting the module to a network.

Table 2-2 4-Wire 56/64-kbps DSU/CSU Module Network Specifications

Description	Specification
Loop rates	DDS[1]: 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 kbps Switched 56: 56 kbps
Data rates	2.4, 4.8, 9.6, 19.2, 56, and 64 kbps
Line requirements	DDS: AT&T Publication 62310 Switched 56: AT&T Publication 41458, Sprint TS-0046
Receiver sensitivity	–45 dB at all loop rates

1. DDS = digital data system (leased or dedicated lines).

Fractional T1/T1 DSU/CSU WAN Module

The fractional T1/T1 DSU/CSU WAN module includes an RJ-48C port. Cables are not included with the module; however, port pinouts are listed in the section "Fractional T1/T1 DSU/CSU Module Port Pinouts" in the appendix "Cabling Specifications for the Cisco 2524 and Cisco 2525 Routers."

Warning Network hazardous voltages are present in the BRI, fractional T1/T1, and switched 56 cables. If you detach the cable, detach the end away from the router first to avoid possible electric shock. Network hazardous voltages are also present in the area of the BRI (RJ-45), fractional T1/T1 (RJ-48C), and switched 56 (RJ-11 or RJ-48S) ports, regardless of whether power is OFF or ON. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Table 2-3 lists network specifications to consider before connecting the fractional T1/T1 DSU/CSU WAN module to a network.

Table 2-3 Fractional T1/T1 DSU/CSU WAN Module Network Specifications

Description	Specification
Line rate	1.544 Mbps[1]
Data rates	*n* x 56 or *n* x 64 kbps, where *n* = 1 to 24[2]
Standards	AT&T Publication 62411, 54016, and 43801

1. Mbps = megabits per second.
2. The T1 interface is not channelized.

ISDN Connections

Use an appropriate cable (not included) to connect the router directly to an ISDN. (See Table 2-4.) Refer to the section "ISDN BRI Port and Cable Pinouts" in the appendix "Cabling Specifications for the Cisco 2524 and Cisco 2525 Routers" for port and cable pinouts.

Note the following warnings:

Warning Network hazardous voltages are present in the BRI, fractional T1/T1, and switched 56 cables. If you detach the cable, detach the end away from the router first to avoid possible electric shock. Network hazardous voltages are also present in the area of the BRI (RJ-45), fractional T1/T1 (RJ-48C), and switched 56 (RJ-11 or RJ-48S) ports, regardless of whether power is OFF or ON. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Warning The ISDN connection is regarded as a source of voltage that should be inaccessible to user contact. Do not attempt to tamper with or open any public telephone operator (PTO)-provided equipment or connection hardware. Any hardwired connection (other than by nonremovable, connect-one-time-only lug) must be made only by PTO staff or suitably trained engineers. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Table 2-4 lists the specifications for ISDN BRI cables.

Table 2-4 ISDN BRI Cable Specifications

Specification	High-Capacitance Cable	Low-Capacitance Cable
Resistance (at 96 kHz)	160 ohms/km	160 ohms/km
Capacitance (at 1 kHz)	120 nF[1]/km	30 nF/km
Impedance (96 kHz)	75 ohms	150 ohms
Wire diameter	0.024" (0.6 mm)	0.024" (0.6 mm)
Distance limitation	32.8' (10 m)	32.8' (10 m)

1. nF = nanoFarad.

Synchronous Serial Connections

The serial port on the five-in-one synchronous serial WAN module is a 60-pin, D-type connector. The synchronous serial port (except the EIA-530) can be configured as DTE or DCE, depending on the attached cable. All DTE serial ports require external clocking from a DSU/CSU or other DCE device.

You must use a special serial cable to connect the router to a modem or DSU/CSU. This cable is available from Cisco and is usually ordered with the system. The cable uses a DB-60 connector on the chassis end. See the appendix “Cabling Specifications for the Cisco 2524 and Cisco 2525 Routers” for cable pinouts. For ordering information, contact a customer service representative.

Note Because of the small size of the pins on the DB-60 serial connector, attempting to manufacture your own serial cables is not recommended.

As with all signaling systems, EIA/TIA-232 signals can travel a limited distance at any given bit rate; generally, the slower the data rate, the greater the distance. Table 2-5 shows the standard relationship between baud rate and maximum distance.

Table 2-5 EIA/TIA-232 Speed and Distance Limitations

Data Rate (Baud)	Distance (Feet)	Distance (Meters)
2400	200	60
4800	100	30
9600	50	15
19200	50	15
38400	50	15
57600	25	7.6
115200	12	3.7

The use of balanced drivers allows EIA/TIA-449 signals to travel greater distances than the EIA/TIA-232 standard. Table 2-6 lists the standard relationship between baud rate and maximum distance for EIA/TIA-449 signals. These limits are also valid for V.35 and X.21.

Table 2-6 EIA/TIA-449 Speed and Distance Limitations

Data Rate (Baud)	Distance (Feet)	Distance (Meters)
2400	4,100	1,250
4800	2,050	625
9600	1,025	312
19200	513	156
38400	256	78
56000	102	31
T1	50	15

Caution The EIA/TIA-449 and V.35 interfaces support data rates up to 2.048 Mbps. Exceeding this maximum could result in loss of data and is not recommended.

Ethernet Connections

On the Cisco 2524 router, there are two Ethernet ports, an AUI port and a 10BaseT port, on the rear panel of the router. To connect your router to an Ethernet network, you can use either the Ethernet AUI or 10BaseT port, but not both. The router automatically detects which port is in use. (If you attempt to use both ports, only the 10BaseT port will work.)

Use the following equipment to connect to the Ethernet AUI port:

- Ethernet AUI cable connected to a transceiver
- Ethernet transceiver connected directly to the router's AUI port

The connection to the AUI port can be attached using either a slide-latch or jackscrew connector.

The distance limitations for the IEEE 802.3 (10Base5 coaxial cable) specification indicate a maximum segment distance of 1,640 feet (500 m) at a transmission rate of 10 Mbps.

The distance limitations for Ethernet 10BaseT indicate a maximum segment distance of 328 feet (100 m); Ethernet 10Base2 has a maximum segment distance of 607 feet (185 m).

Token Ring Connections

On the Cisco 2525 router, there are two Token Ring ports, a STP port and a UTP port, on the rear panel of the router.

The distance limitations for the IEEE 802.5 specification indicate a maximum segment distance of 328 feet (100 m) at a transmission rate of 4 or 16 Mbps for UTP cabling. The distance limitation is 1,640 feet (500 m) for STP cabling.

Console and Auxiliary Port Considerations

Both routers include an asynchronous serial console and auxiliary port. The console and auxiliary ports provide access to the router either locally (with a console terminal) or remotely (with a modem). This section discusses important cabling information to consider before connecting a console terminal (an ASCII terminal or PC running terminal emulation software) to the console port or modem to the auxiliary port.

The main difference between the console and auxiliary ports is that the auxiliary port supports flow control and the console port does not. Flow control paces the transmission of data between a sending device and a receiving device. Flow control ensures that the receiving device can absorb the data sent to it before the sending device sends more. When the buffers on the receiving device are full, a message is sent to the sending device to suspend transmission until the data in the buffers has been processed. Because the auxiliary port supports flow control, it is ideally suited for use with the high-speed transmissions of a modem. Console terminals transmit at slower speeds than modems; therefore, the console port is ideally suited for use with console terminals.

Console Port Connections

Both routers include an EIA/TIA-232 asynchronous serial console port (RJ-45). Depending on the cable and the adapter used, this port will appear as a DTE or DCE device at the end of the cable. Your router comes with cables and adapters to connect a console terminal (an ASCII terminal or PC running terminal emulation software) to the console port. To connect an ASCII terminal to the console port, use the RJ-45 roll-over cable with the female RJ-45-to-DB-25 adapter (labeled Terminal). To connect a PC running terminal emulation software to the console port, use the RJ-45 roll-over cable with the female RJ-45-to-DB-9 adapter (labeled Terminal). The default parameters for the console port are 9600 baud, 8 data bits, no parity, and 2 stop bits. The console port does not support flow control. For detailed information about installing a console terminal, see the section “Connecting to the Console Port” in the chapter “Installing the Cisco 2524 and Cisco 2525 Routers.” See the appendix “Cabling Specifications for the Cisco 2524 and Cisco 2525 Routers” for cable and port pinouts.

Auxiliary Port Connections

Both routers include an EIA/TIA-232 asynchronous serial auxiliary port (RJ-45) that supports flow control. Depending on the cable and the adapter used, this port will appear as a DTE or DCE device at the end of the cable. Your router comes with a cable and an adapter to connect a modem to the auxiliary port. To connect a modem to the auxiliary port, use the RJ-45 roll-over cable with the male RJ-45-to-DB-25 adapter (labeled Modem). For detailed information about connecting devices to the auxiliary port, see the section “Connecting the Console Terminal and Modem” in the chapter “Installing the Cisco 2524 and Cisco 2525 Routers.” See the appendix “Cabling Specifications for the Cisco 2524 and Cisco 2525 Routers” for cable and port pinouts.

Inspecting the System

Do not unpack the router until you are ready to install it. If the final installation site will not be ready for some time, keep the chassis in its shipping container to prevent accidental damage. When you have determined where you want the router installed, proceed with unpacking it.

The router, cables, UniverCD or printed publications, and any optional equipment you ordered might be shipped in more than one container. When you unpack each shipping container, check the packing list to ensure that you received all of the following items:

- Cisco 2524 or Cisco 2525 router
- 6-foot (1.8-meter) power cord
- Jackscrews for the AUI connector (Cisco 2524 router only)
- Console and auxiliary cable kit, which includes the following items:
  - RJ-45-to-RJ-45 roll-over cable
  - RJ-45-to-DB-9 female DTE adapter (labeled Terminal)
  - RJ-45-to-DB-25 female DTE adapter (labeled Terminal)
  - RJ-45-to-DB-25 male DCE adapter (labeled Modem)
- Optional equipment (such as network interface cables and WAN modules)
- *Cisco Information Packet* publication, UniverCD, and optional printed publications specified on your order

Inspect all items for shipping damage. If anything appears to be damaged, or if you encounter problems when installing or configuring your system, contact a customer service representative.

CHAPTER 3

Installing the Cisco 2524 and Cisco 2525 Routers

This chapter guides you through the installation of the Cisco 2524 and Cisco 2525 routers and includes the following sections:

- Required Tools and Parts
- Setting Up the Chassis
- Connecting the DC Power Supply
- Connecting to the Network
- Connecting the Console Terminal and Modem
- What to Do after Installing the Router Hardware

Warning Only trained and qualified personnel should be allowed to install or replace this equipment. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Required Tools and Parts

Following are the tools and parts required to install the router:

- Flat-blade screwdrivers: small, 3/16-inch (0.476 cm) and medium, 1/4-inch (0.625 cm)
- ESD-preventive wrist strap
- A thread-forming screw (which is not included), to attach a ground wire to the protective grounding terminal on the rear panel of the chassis
- Rubber feet for setting the router on a desktop, or rack-mount brackets for mounting the router in a rack or on a wall (screws not included)
- An interface cable (not included) for each LAN and WAN interface

In addition, you might need the following external equipment:

- Ethernet transceiver, Ethernet 10BaseT hub, or PC with a network interface card for Ethernet LAN connections.
- Token Ring media attachment unit (MAU) for Token Ring connections.
- NT1 device for ISDN BRI WAN connections, if you do not have the module with the integrated NT1 device.
- Console terminal (an ASCII terminal or a PC running terminal emulation software) configured for 9600 baud, 8 data bits, no parity, and 2 stop bits. A terminal is required unless you are using the AutoInstall procedure. See the section “Connecting the Console Terminal and Modem” later in this chapter for instructions on connecting a console terminal.
- Modem for remote system access (optional).

Setting Up the Chassis

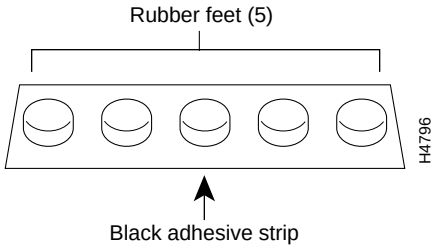
You can set the chassis on a desktop, install it in a rack, or mount it on a wall or other flat surface. Use the procedure in this section that best fits the needs of your network.

Setting the Chassis on a Desktop

Before setting the router on a desktop, shelf, or other flat, secure surface, perform the following steps to install the rubber feet:

Step 1 Locate the rubber feet on the black adhesive strip that shipped with the chassis. (See Figure 3-1.)

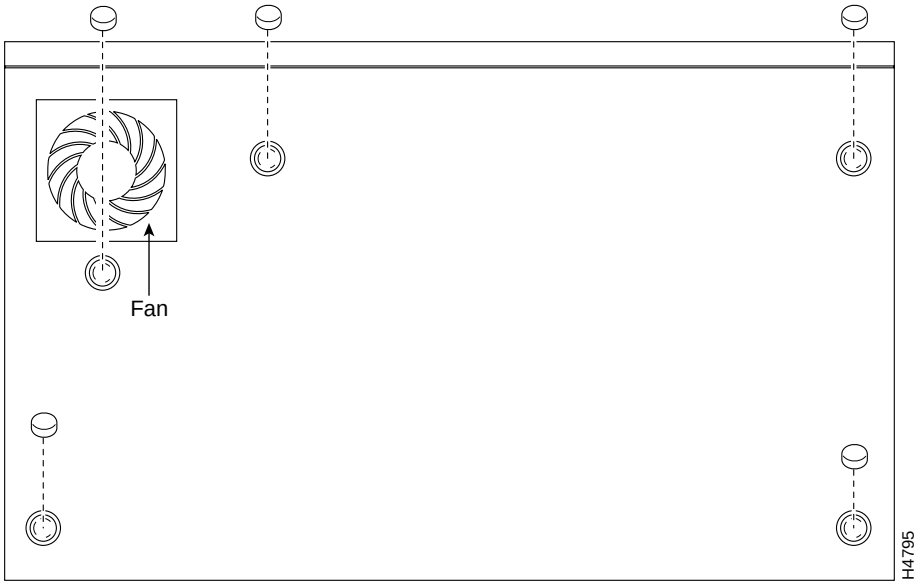
Figure 3-1 Identifying the Rubber Feet



Step 2 Place the router upside down on a smooth, flat surface.

Step 3 Peel off the rubber feet from the black adhesive strip and place them adhesive-side down onto the five round, recessed areas on the bottom of the chassis, as shown in Figure 3-2.

Figure 3-2 Installing the Rubber Feet



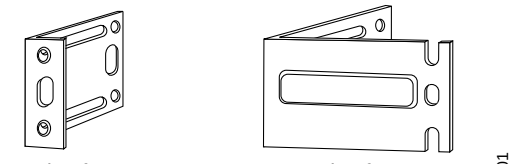
Step 4 Place the router right-side up on a flat, smooth, secure surface.

Caution Do not place anything on top of the router that weighs more than 10 pounds (4.5 kg). Excessive weight on top could damage the chassis.

Rack-Mounting the Chassis

This section describes the procedures for rack-mounting the chassis. The chassis comes with a bracket for use with a 19-inch rack or, if specified in your order, an optional larger bracket for use with a 24-inch rack. The brackets are shown in Figure 3-3.

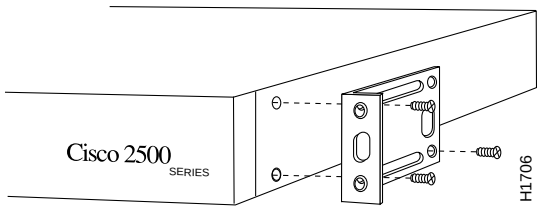
Figure 3-3 Identifying the Brackets



Attaching the Brackets

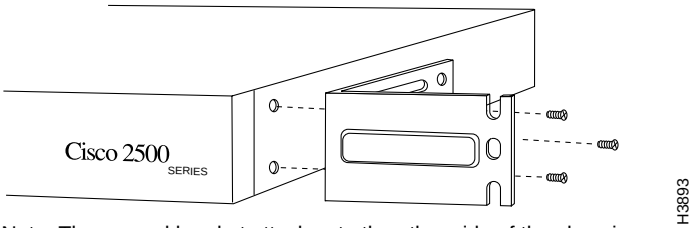
To install the chassis in a rack with the front panel forward, attach the brackets as shown in Figure 3-4 or Figure 3-5.

Figure 3-4 19-Inch Bracket Installation—Front Panel Forward



Note: The second bracket attaches to the other side of the chassis.

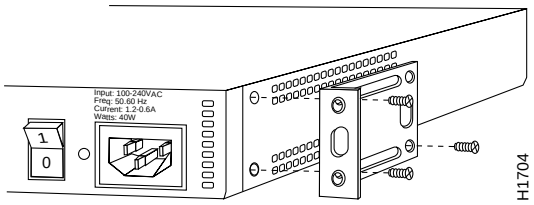
Figure 3-5 24-Inch Bracket Installation—Front Panel Forward



Note: The second bracket attaches to the other side of the chassis.

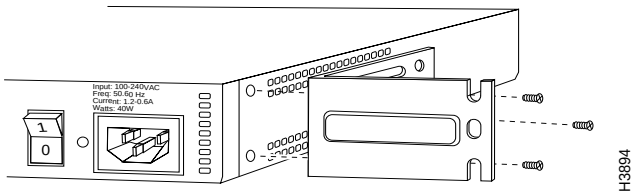
To install the chassis in a rack with the rear panel forward, attach the brackets as shown in Figure 3-6 or Figure 3-7.

Figure 3-6 19-Inch Bracket Installation—Rear Panel Forward



Note: The second bracket attaches to the other side of the chassis.

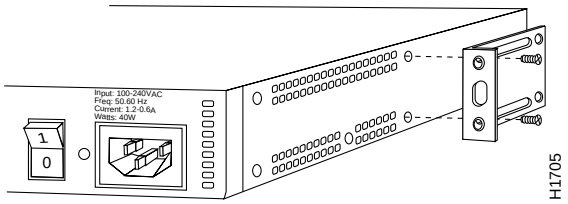
Figure 3-7 24-Inch Bracket Installation—Rear Panel Forward



Note: The second bracket attaches to the other side of the chassis.
The brackets can also be installed with the front panel forward.

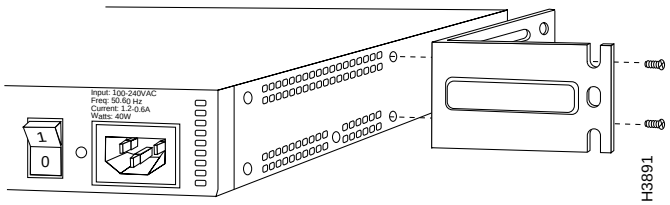
To install the chassis in a center-mount telco rack, attach the brackets as shown in Figure 3-8 or Figure 3-9.

Figure 3-8 Telco 19-Inch Bracket Installation—Rear Panel Forward



Note: The second bracket attaches to the other side of the chassis. The brackets can also be installed with the front panel forward.

Figure 3-9 Telco 24-Inch Bracket Installation—Rear Panel Forward

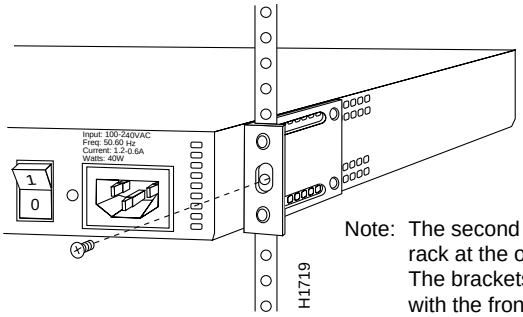


Note: The second bracket attaches to the other side of the chassis. The brackets can also be installed with the front panel forward.

Installing in a Rack

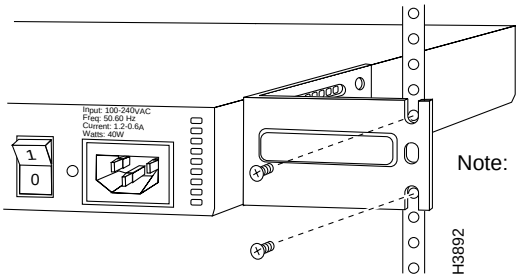
After the brackets are secured to the chassis, you can rack-mount the chassis. Using the screws you provide, attach the chassis to the rack as shown in Figure 3-10 or Figure 3-11.

Figure 3-10 Attaching the Chassis to the 19-Inch Rack—Rear Panel Forward



Note: The second bracket attaches to the rack at the other side of the chassis. The brackets can also be installed with the front panel forward.

Figure 3-11 Attaching the Chassis to the 24-Inch Rack—Rear Panel Forward



Note: The second bracket attaches to the rack at the other side of the chassis. The brackets can also be installed with the front panel forward.

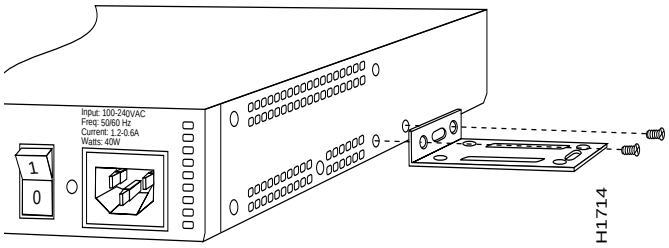
Wall-Mounting the Chassis

Use the smaller brackets (for use with a 19-inch rack) to wall-mount the chassis. The smaller brackets provide the most stable position for the chassis.

Take the following steps to wall-mount the chassis:

Step 1 Attach the brackets as shown in Figure 3-12.

Figure 3-12 Attaching the Wall-Mount Brackets

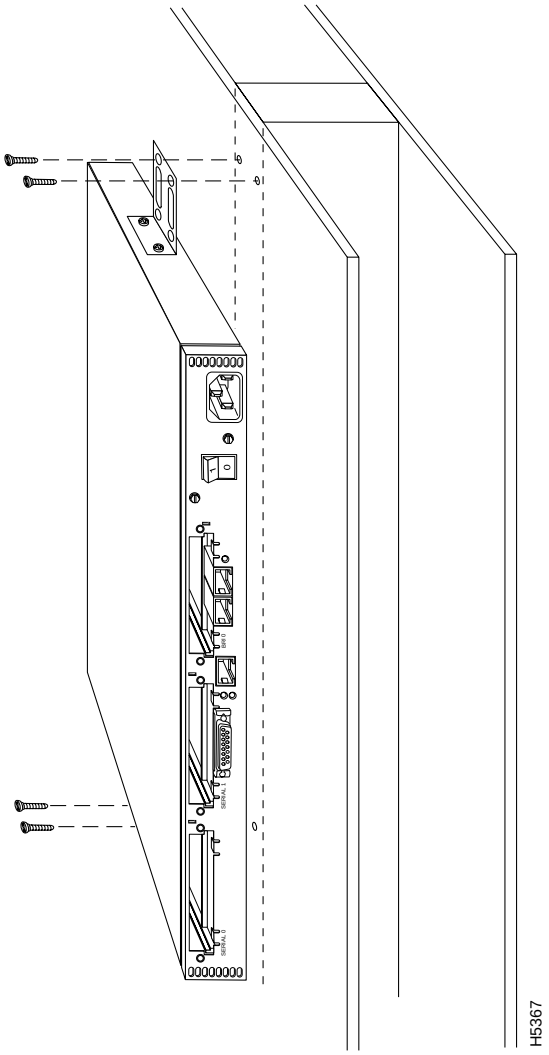


Step 2 Attach the chassis assembly to the wall as shown in Figure 3-13, using screws and anchors that you provide. We recommend the following:

- For the best support of the chassis and cables, attach the brackets so that the screws align with a vertical wall stud.
- For the best ventilation of the chassis, mount the chassis with the power supply and fan at the top.

Caution To prevent the chassis from pulling away from the wall when cables are attached, align the brackets and screws with a vertical wall stud. (See Figure 3-13.) To ensure adequate ventilation, make sure there is clearance between the router and the wall.

Figure 3-13 Wall-Mounting the Chassis



Connecting the DC Power Supply

The Cisco 2524 router offers an optional direct current (DC) power supply (not available with the Cisco 2525 router). This section describes the DC power supply specifications and wiring.

Warning This unit is intended for installation in restricted access areas. (To see translated versions of the warning, refer to the appendix "Translated Safety Warnings.")

DC Power Specifications

The DC power supply is intended for use in DC operating environments. Table 3-1 lists the power supply specifications.

Table 3-1 DC Power Supply Specifications

Description	Design Specification
Power (input)	40W, –40 to –72 VDC
Wire gauge for power connections	14 AWG[1]

1. AWG = American Wire Gauge.

Wiring the DC Power Supply

If you ordered a Cisco 2524 router with a DC power supply, follow the directions in this section to wire the terminal block.

Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Note This product is intended for installation in restricted access areas and is approved for use with copper conductors only. The installation must comply with all applicable codes.

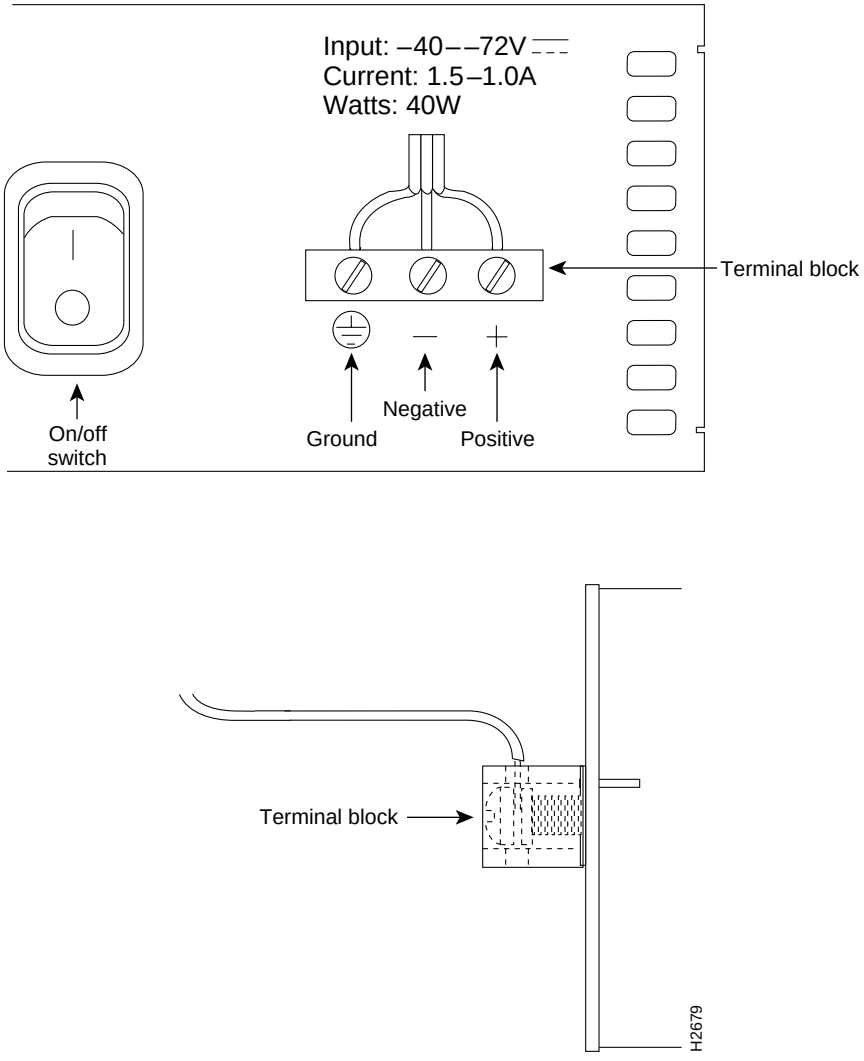
Figure 3-14 shows the DC power supply terminal block. Take the following steps to wire the terminal block:

Step 1 Attach the appropriate lugs at the wire end of the power supply cord.

Step 2 Wire the DC power supply to the terminal block, as shown in Figure 3-14.

Warning The illustration shows the DC power supply terminal block. Wire the DC power supply using the appropriate lugs at the wiring end, as illustrated. The proper wiring sequence is ground to ground, positive to positive (line to L), and negative to negative (neutral to N). Note that the ground wire should always be connected first and disconnected last. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Figure 3-14 DC Power Supply Connections



Warning When stranded wiring is required, use approved wiring terminations, such as closed-loop or spade-type with upturned lugs. These terminations should be the appropriate size for the wires and should clamp both the insulation and conductor. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Caution Do not overtorque the terminal block captive thumbscrew or terminal block contact screws. The recommended torque is 8.2 0.4 inch-lb

Warning After wiring the DC power supply, remove the tape from the circuit breaker switch handle and reinstate power by moving the handle of the circuit breaker to the ON position. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Connecting to the Network

This section explains how to connect the router to your network, using the Ethernet (AUI or 10BaseT) or Token Ring (STP or UTP) ports or the WAN modules.

Warning Do not work on the system or connect or disconnect cables during periods of lightning activity. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Connecting to an Ethernet Network

If you have a Cisco 2524 router, it includes both an Ethernet AUI port and a 10BaseT port. To connect your router to an Ethernet network, you can use either the Ethernet AUI or 10BaseT port, but not both. The first port connected will work. (If you attempt to use both ports, only the 10BaseT port will work.)

You can connect the router to your Ethernet network in one of the following ways:

- Use an Ethernet AUI cable to connect the Ethernet AUI port to an Ethernet transceiver. (See Figure 3-15.)
- Use a straight-through 10BaseT cable to connect the 10BaseT port to a 10BaseT hub. (See Figure 3-16.)
- Use a crossover 10BaseT cable to connect the 10BaseT port to a PC network interface card. (See Figure 3-17.)

Note If your Ethernet connection requires jackscrews, remove the slide-latch assembly from the AUI connector and attach the jackscrews provided.

Figure 3-15 Connecting to an Ethernet Transceiver

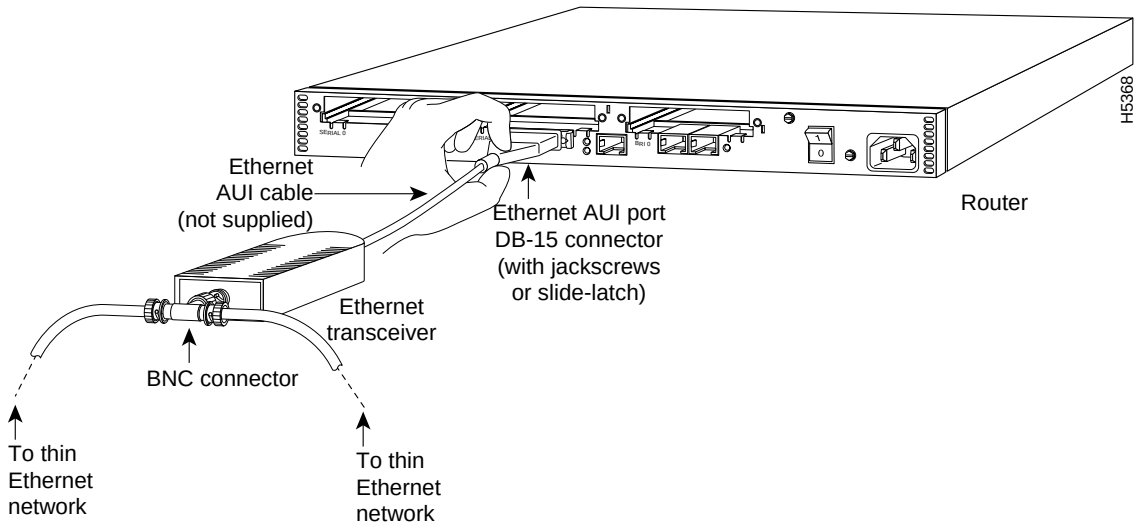


Figure 3-16 Connecting to a 10BaseT Hub

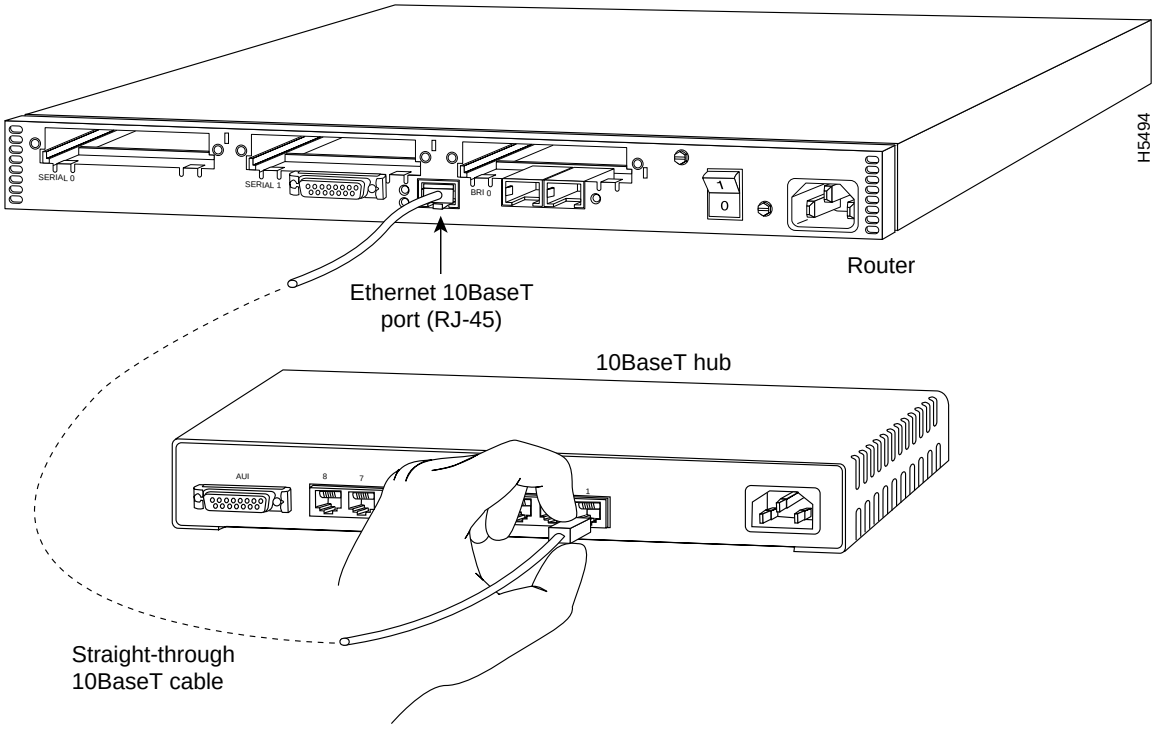
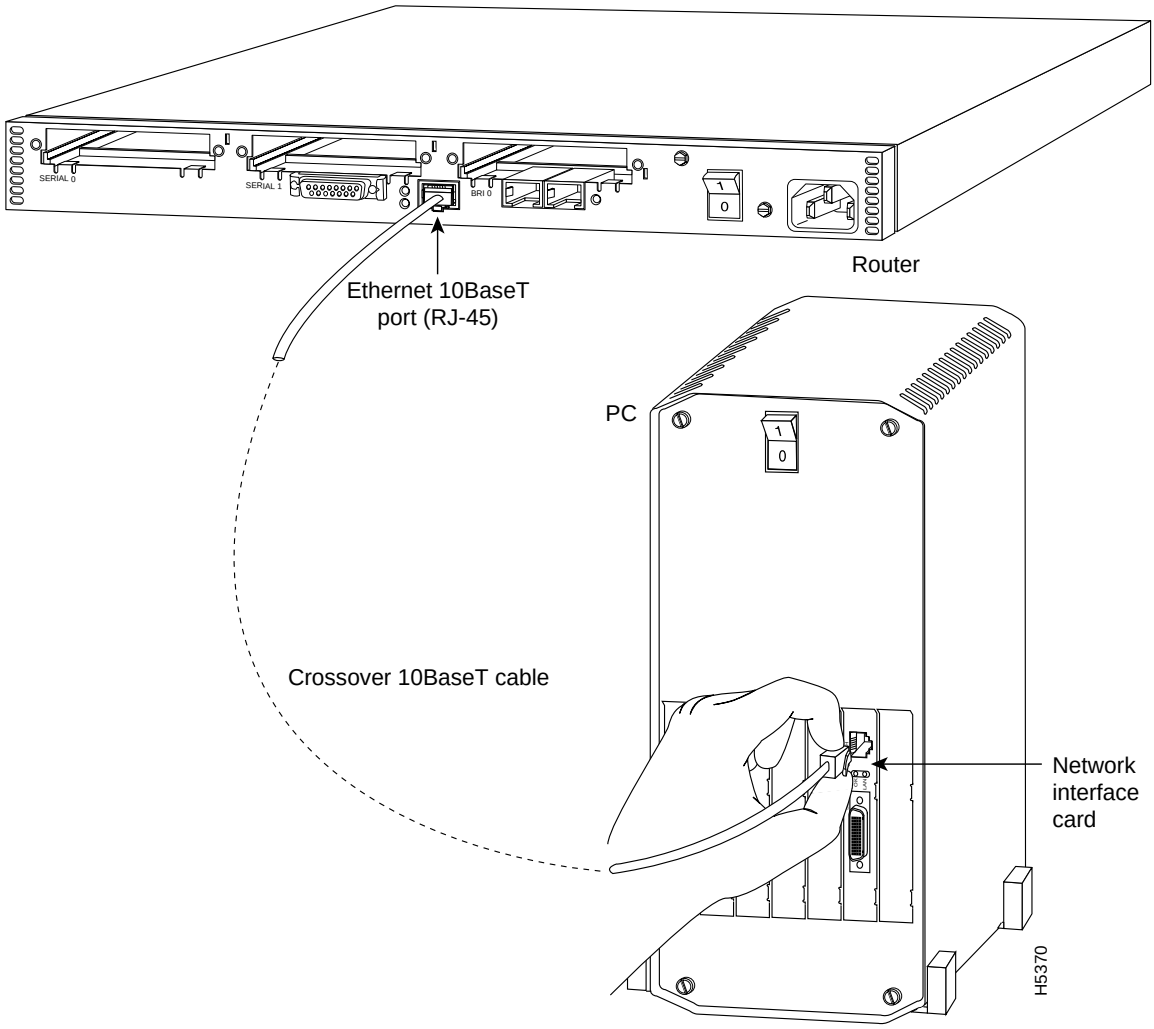


Figure 3-17 Connecting to a PC Network Interface Card



Connecting to a Token Ring Network

If you have a Cisco 2524 router, you can connect the router to your Token Ring network in one of the following ways:

- Use a shielded Token Ring lobe cable to connect the Token Ring port (DB-9) to a media attachment unit (MAU). To ensure agency compliance with electromagnetic emissions requirements (EMI), make sure the cable is shielded. (See Figure 3-18.)
- Use a twisted-pair cable to connect the Token Ring port (RJ-45) to a Token Ring hub. (See Figure 3-19.)

  If the transmission rate of your Token Ring network is 4 Mbps, use a UTP cable. If the transmission rate of your Token Ring network is 16 Mbps, use an STP cable.

Figure 3-18 Connecting to a MAU

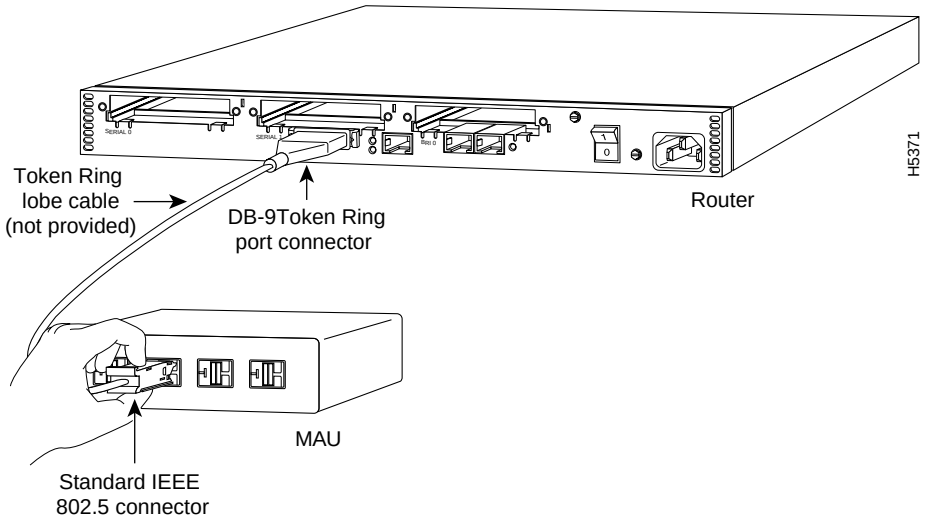
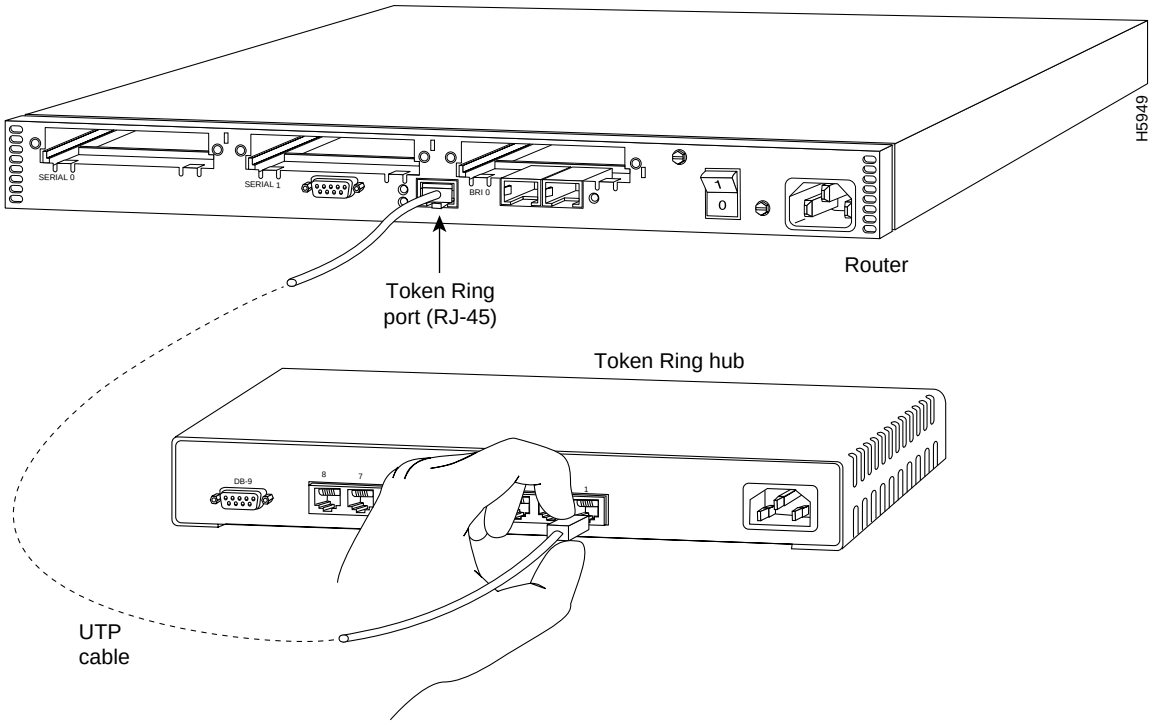


Figure 3-19 Connecting to a Token Ring Hub



Connecting to a WAN

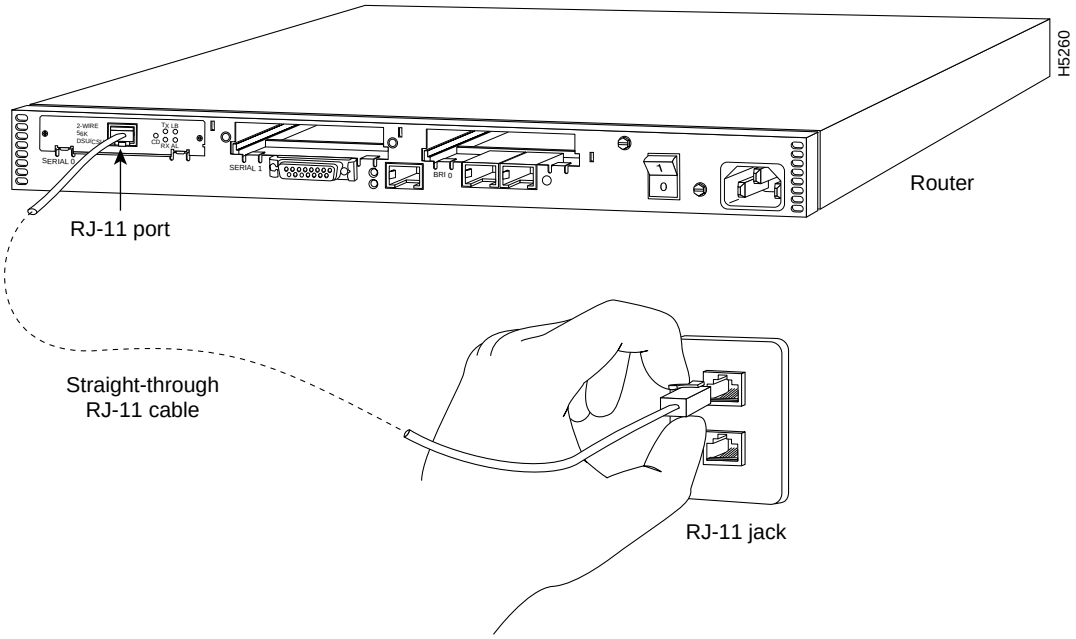
Although the illustrations in this section show the Cisco 2524 router, the procedures are the same for both the Cisco 2524 and Cisco 2525 routers.

Warning Do not work on the system or connect or disconnect cables during periods of lightning activity. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Take the following steps to connect the router to your WAN:

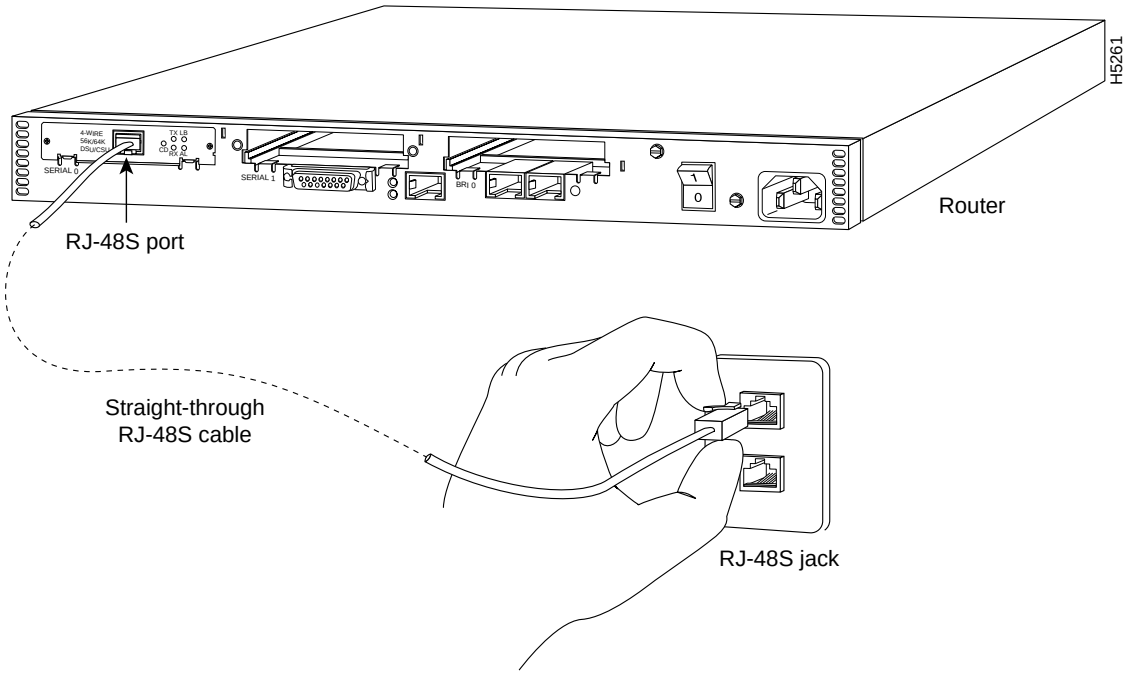
Step 1 If you have a 2-wire switched 56-kbps module, use a straight-through RJ-11-to-RJ-11 cable to connect the RJ-11 port to an RJ-11 jack. (See Figure 3-20.)

Figure 3-20 Connecting the 2-Wire Switched 56-kbps DSU/CSU Module to an RJ-11 Jack



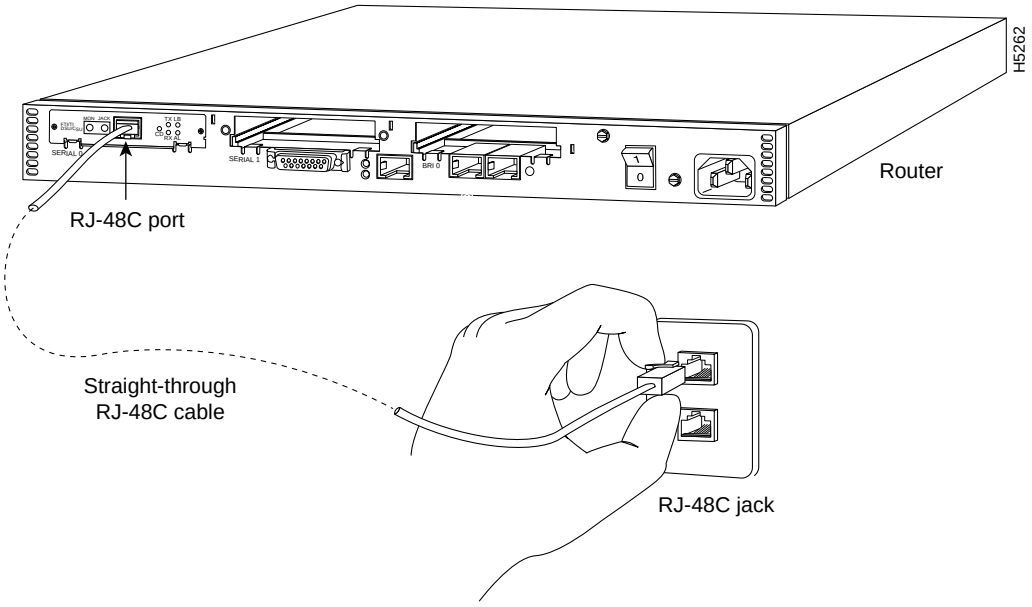
Step 2 If you have a 4-wire 56/64-kbps DSU/CSU module, use a straight-through RJ-48S-to-RJ-48S cable to connect the RJ-48S port to an RJ-48S jack. (See Figure 3-21.)

Figure 3-21 Connecting the 4-Wire 56/64-kbps DSU/CSU Module to an RJ-48S Jack



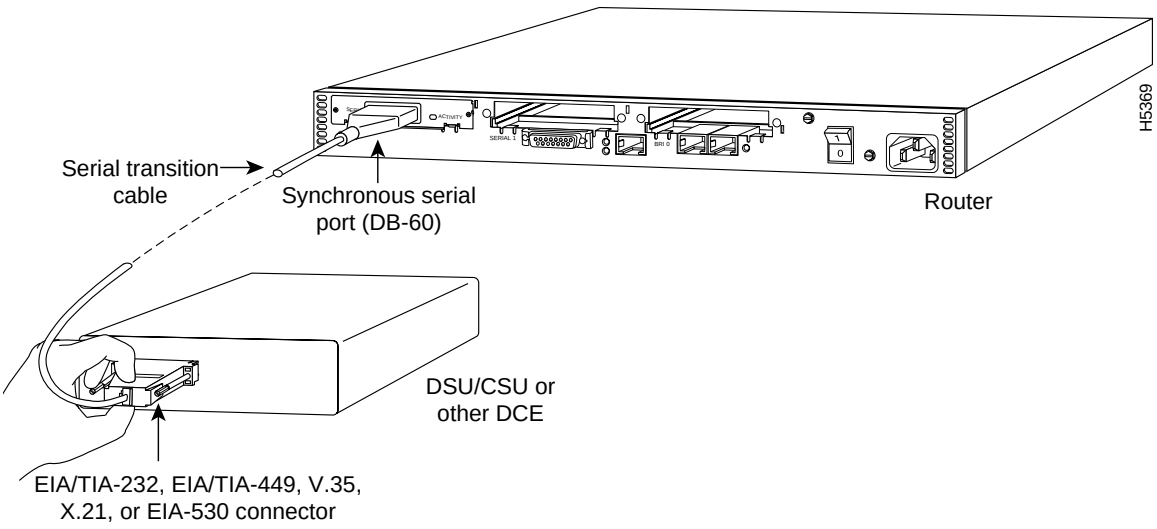
Step 3 If you have a fractional T1/T1 DSU/CSU module, use a straight-through RJ-48C-to-RJ-48C cable to connect the RJ-48C port to an RJ-48C jack. (See Figure 3-22.)

Figure 3-22 Connecting the Fractional T1/T1 DSU/CSU Module to an RJ-48C Jack



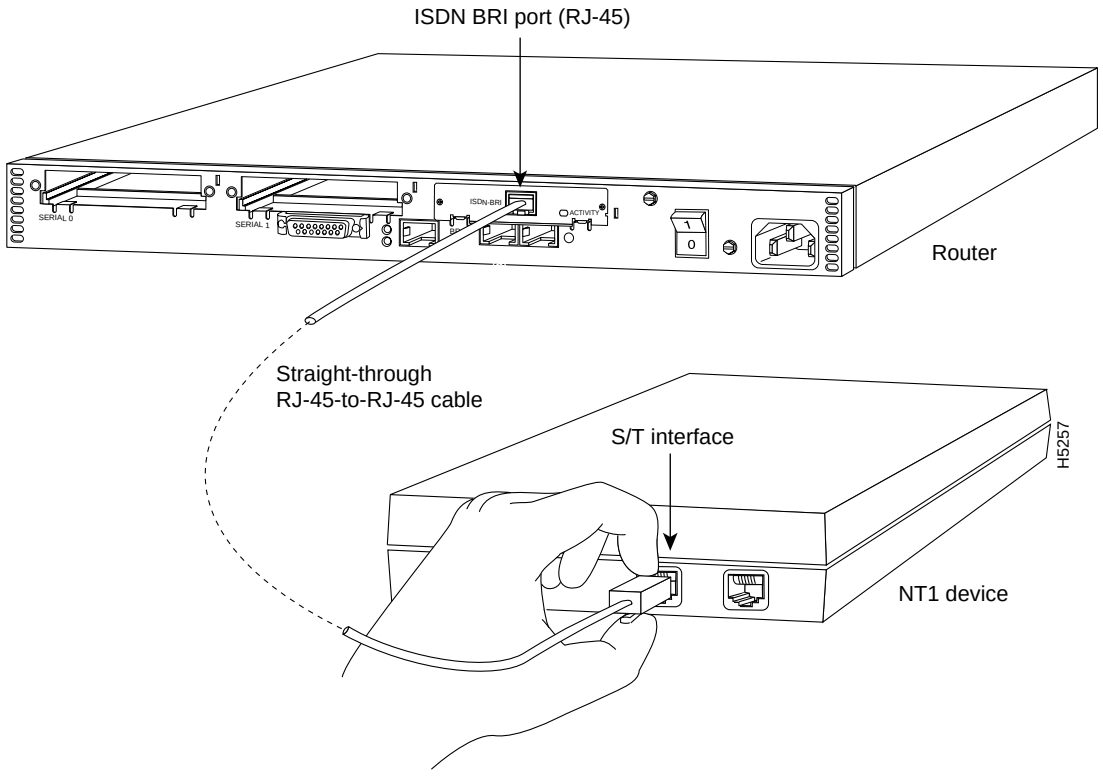
Step 4 If you have a synchronous serial module, use a serial transition cable to connect the synchronous serial port to a modem or DSU/CSU. (See Figure 3-23.)

Figure 3-23 Connecting Synchronous Serial Cables



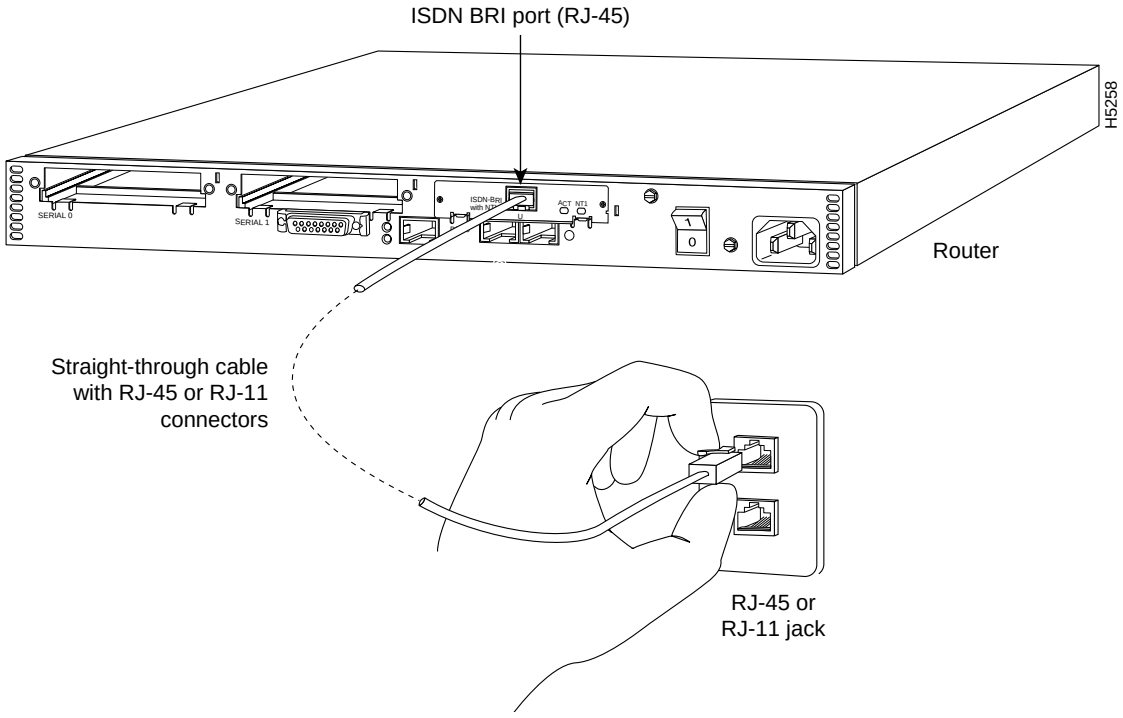
Step 5 If you have an ISDN BRI module (without an integrated NT1 device), use a straight-through RJ-45-to-RJ-45 cable to connect the ISDN BRI (RJ-45) port to an NT1 device. (See Figure 3-24.)

Figure 3-24 Connecting the ISDN BRI Module to an NT1 Device



Step 6 If you have an ISDN BRI module with an integrated NT1 device, use a straight-through RJ-45-to-RJ-45 cable to connect the ISDN BRI (RJ-45) port to an RJ-45 or RJ-11 jack. (See Figure 3-25.)

Figure 3-25 Connecting the ISDN BRI with Integrated NT1 Module to an RJ-45 Jack



Step 7 If the router is configured with fewer than three WAN modules, install a blank slot cover over each open slot to ensure proper airflow.

Step 8 Using an M 3.5 thread-forming screw (not included), attach a ground wire to the protective grounding terminal on the rear panel of the chassis.

Step 9 Connect the power cable to the router and the power source.

Connecting the Console Terminal and Modem

You use the console terminal for local administrative access to the router. You can connect only a terminal to the console port. You can use the auxiliary port with a terminal or a modem for remote access to the router.

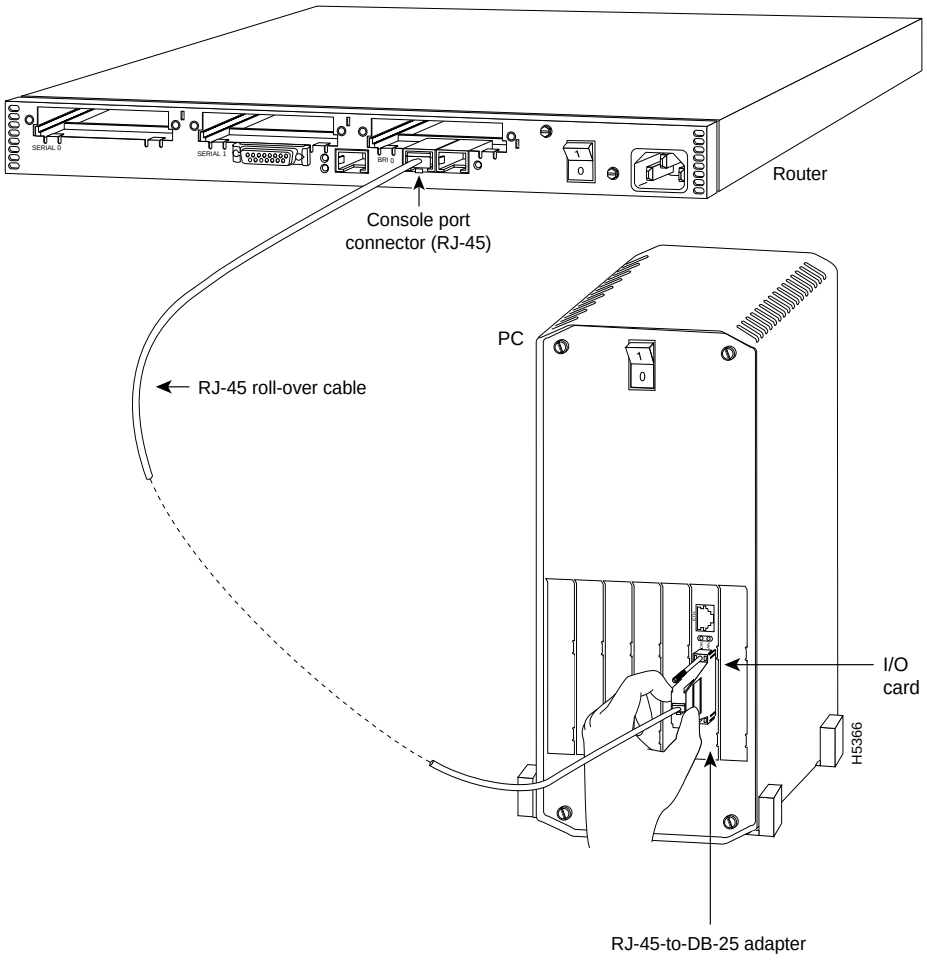
Connecting to the Console Port

Take the following steps to connect a terminal (an ASCII terminal or a PC running terminal emulation software) to the console port on the router:

Step 1 Connect the terminal using an RJ-45 roll-over cable and an RJ-45-to-DB-25 or RJ-45-to-DB-9 adapter. The adapters provided by Cisco Systems are labeled Terminal. Other types of adapters are not included. (See Figure 3-26.)

Additional information on roll-over cable pinouts is provided in the appendix "Cabling Specifications for the Cisco 2524 and Cisco 2525 Routers."

Figure 3-26 Connecting the Console Terminal



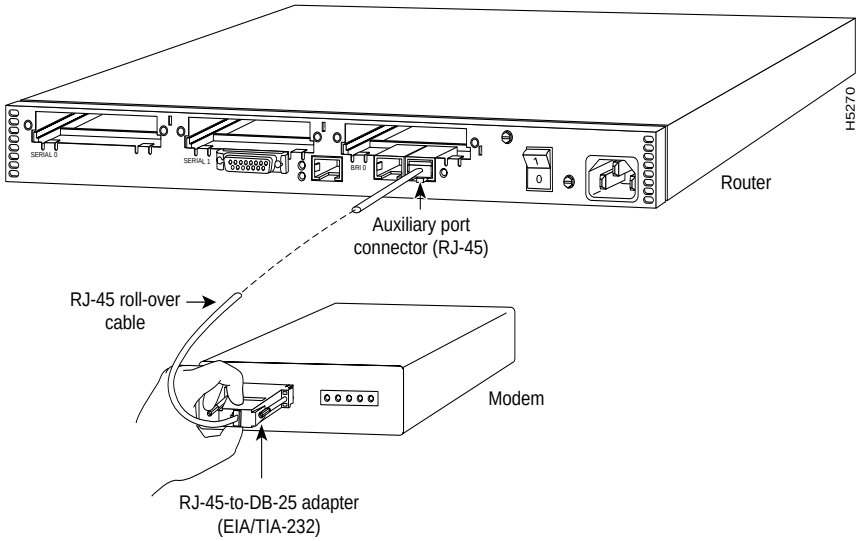
Step 2 Configure your terminal or PC terminal emulation software for 9600 baud, 8 data bits, no parity, and 2 stop bits.

Connecting a Modem to the Auxiliary Port

Take the following steps to connect a modem to the auxiliary port on the router:

Step 1 Connect a modem to the auxiliary port using an RJ-45 roll-over cable with an RJ-45-to-DB-25 or RJ-45-to-DB-9 adapter. The adapter provided by Cisco Systems is labeled Modem. (See Figure 3-27.)

Figure 3-27 Connecting a Modem to the Auxiliary Port



Step 2 Make sure that your modem and the auxiliary port on the router are configured for the same transmission speed (38400 baud is typical) and hardware flow control with Data Carrier Detect (DCD) and Data Terminal Ready (DTR) operations.

Warning This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

What to Do after Installing the Router Hardware

After you have installed the router, proceed to the chapter "Configuring the Cisco 2524 and Cisco 2525 Routers" for software configuration information.

CHAPTER 4

Configuring the Cisco 2524 and Cisco 2525 Routers

This chapter describes how to configure the Cisco 2524 and Cisco 2525 routers and contains the following sections:

- Booting the Router for the First Time
- Configuring the Router
- Specifying the Boot Method
- Checking the Configuration Settings
- Getting More Information

This chapter provides just enough information to get the router up and running. For Cisco IOS Release 11.0 and earlier releases, refer to the *Router Products Configuration Guide* for additional configuration information. For Cisco IOS Release 11.1 and later releases, refer to the *Configuration Fundamentals Configuration Guide*.

Booting the Router for the First Time

Each time you power on the router, it goes through the following boot sequence:

1. The router goes through power-on self-test diagnostics to verify basic operation of the CPU, memory, and interfaces.
2. The system bootstrap software (boot image) executes and searches for a valid Cisco IOS image (router operating system software). The source of the Cisco IOS image (Flash memory or a Trivial File Transfer Protocol [TFTP] server) is determined by the configuration register setting. The factory-default setting for the configuration register is 0x2102, which indicates that the router should attempt to load a Cisco IOS image from Flash memory.

3. If after five attempts a valid Cisco IOS image is not found in Flash memory, the router reverts to boot ROM mode (which is used to install or upgrade a Cisco IOS image).
4. If a valid Cisco IOS image is found, then the router searches for a valid configuration file.
5. If a valid configuration file is not found in NVRAM, the router runs the System Configuration Dialog so you can configure it manually. For normal router operation, there must be a valid Cisco IOS image in Flash memory and a configuration file in NVRAM.

The first time you boot your router, you will need to configure the router interfaces and then save the configuration to a file in NVRAM. Proceed to the next section, "Configuring the Router," for configuration instructions.

Configuring the Router

You can configure the router using one of the following procedures:

- Configuration mode—Recommended if you are familiar with Cisco IOS commands.
- AutoInstall—Recommended for automatic installation if another router running Cisco IOS software is installed on the network. This configuration method must be set up by someone with experience using Cisco IOS software.
- System Configuration Dialog—Recommended if you are not familiar with Cisco IOS commands.

Use the procedure that best fits the needs of your network configuration and level of Cisco IOS experience.

Timesaver Acquire the correct network addresses from your system administrator or consult your network plan to determine correct addresses before you begin to configure the router.

Using Configuration Mode

You can configure the router manually if you prefer not to use AutoInstall or the System Configuration Dialog. Take the following steps to configure the router manually:

Step 1 Connect a console terminal following the instructions in the section "Connecting the Console Terminal and Modem" in the chapter "Installing the Cisco 2524 and Cisco 2525 Routers," and then power ON the router.

Step 2 When you are prompted to enter the initial dialog, enter **no** to go into the normal operating mode of the router:

```
Would you like to enter the initial dialog? [yes]: no
```

Step 3 After a few seconds you will see the user EXEC prompt (Router>). Enter the **enable** command to enter enable mode. You can only make configuration changes in enable mode.

```
Router> enable
```

The prompt changes to the privileged EXEC (enable) prompt:

```
Router#
```

Step 4 Enter the **configure terminal** command at the enable prompt to enter configuration mode:

```
Router# configure terminal
```

You can now enter any changes you want to the configuration.

Step 5 Press **Ctrl-Z** to exit configuration mode.

To see the current operating configuration, enter the **show running-config** command at the enable prompt:

```
Router# show running-config
```

To see the configuration in NVRAM, enter the **show startup-config** command at the enable prompt:

```
Router# show startup-config
```

The results of the **show running-config** and **show startup-config** commands will be different if you have made changes to the configuration but have not yet written them to NVRAM.

To make your changes permanent, enter the **copy running-config startup-config** command at the enable prompt:

```
Router# copy running-config startup-config
********
```

The router is now configured and will boot with the configuration you entered.

Using AutoInstall

The AutoInstall process is designed to configure the router automatically after connection to your WAN. In order for AutoInstall to work properly, a Transmission Control Protocol/Internet Protocol (TCP/IP) host on your network must be preconfigured to provide the required configuration files. The TCP/IP host may exist anywhere on the network as long as the following two conditions are maintained:

1. The host must be on the remote side of the router's synchronous serial connection to the WAN.
2. User Datagram Protocol (UDP) broadcasts to and from the router and the TCP/IP host must be enabled.

This functionality is coordinated by your system administrator at the site where the TCP/IP host is located. You should not attempt to use AutoInstall unless the required files have been provided on the TCP/IP host. For Cisco IOS Release 11.0 and earlier releases, refer to the publication *Router Products Configuration Guide* for additional information. For Cisco IOS Release 11.1 and later releases, refer to the publication *Configuration Fundamentals Configuration Guide*.

Note AutoInstall works on synchronous serial connections only. The 2-wire switched 56-kbps DSU/CSU module operates on switched 56-kbps circuits only; therefore, you cannot use it for AutoInstall.

Take the following steps to prepare your router for the AutoInstall process:

Step 1 Attach the WAN cable to the router.

Step 2 Turn ON power to the router.

The router will load the operating system image from Flash memory. If the remote end of the WAN connection is connected and properly configured, the AutoInstall process will begin.

If AutoInstall successfully completes, you can write the configuration data to the router's NVRAM. Perform the following step to complete this task.

Step 3 Enter the **copy running-config startup-config** command:

```
Router# copy running-config startup-config
```

Taking this step saves the configuration settings that the AutoInstall process created in the router. If you do not do this, your configuration will be lost the next time you reload the router.

Using the System Configuration Dialog

If you do not plan to use AutoInstall, make sure all the WAN cables are disconnected from the router. This will prevent the router from attempting to the run the AutoInstall process. The router will attempt to run AutoInstall whenever you power it on if there is a WAN connection on both ends and the router does not have a configuration file stored in NVRAM. It can take several minutes for the router to determine that AutoInstall is not set up to a remote TCP/IP host.

If your router does not have a configuration (setup) file and you are not using AutoInstall, the router will automatically start the setup command facility. An interactive dialog called the System Configuration Dialog appears on the console screen. This dialog helps you navigate through the configuration process by prompting you for the configuration information necessary for the router to operate.

Many prompts in the System Configuration Dialog include default answers, which are included in square brackets following the question. To accept a default answer, press **Return**; otherwise, enter your response.

This section gives an example configuration using the System Configuration Dialog. When you are configuring your router, respond as appropriate for your network.

At any time during the System Configuration Dialog, you can request help by typing a question mark (?) at a prompt.

Before proceeding with the System Configuration Dialog, obtain from your system administrator the node addresses and the number of bits in the subnet field (if applicable) of the Ethernet and synchronous serial ports. For more information about Internet Protocol (IP) addresses and subnets, refer to the publication *Internetworking Technology Overview.* (See the section "Getting More Information" at the end of this chapter.)

Take the following steps to configure the router using the System Configuration Dialog:

Step 1 Connect a console terminal to the console connector on the rear panel of your router, and turn ON power to the router. (For more information, refer to the section "Connecting the Console Terminal and Modem" in the chapter "Installing the Cisco 2524 and Cisco 2525 Routers.")

Note The default parameters for the console port are 9600 baud, 8 data bits, no parity, and 2 stop bits.

Step 2 After about 30 seconds, information similar to the following is displayed on the console screen.

Note The messages displayed vary, depending on the Cisco IOS release and feature set you selected. The screen displays in this section are for reference only and may not exactly reflect the screen displays on your console.

When you see this information, you have successfully booted your router:

```
System Bootstrap, Version X.X(XXXX) [XXXXX XX], RELEASE SOFTWARE
Copyright (c) 1986-1992 by Cisco Systems
2500 processor with 4096 Kbytes of main memory

Notice: NVRAM invalid, possibly due to write erase.

F3: 5797928+162396+258800 at 0x3000060
```

```
                Restricted Rights Legend

Use, duplication, or disclosure by the Government is
subject to restrictions as set forth in subparagraph
(c) of the Commercial Computer Software - Restricted
Rights clause at FAR sec. 52.227-19 and subparagraph
(c) (1) (ii) of the Rights in Technical Data and Computer
Software clause at DFARS sec. 252.227-7013.

           Cisco Systems, Inc.
           170 West Tasman Drive
           San Jose, California 95134-1706



Cisco Internetwork Operating System Software
IOS (tm) X000 Software (IGS-J-L), Version XX.X(XXXX) [XXXXX XXX]
Copyright (c) 1986-1996 by Cisco Systems, Inc.
Compiled Fri 20-Oct-95 16:02 by XXXXX
Image text-base: 0x03030FC0, data-base: 0x00001000
Cisco 252X (68030) processor (revision A) with 4092K/2048K bytes of
memory.
Processor board ID 00000000
Bridging software.
SuperLAT software copyright 1990 by Meridian Technology Corp).
X.25 software, Version X.X, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).
Basic Rate ISDN software, Version X.X.
1 Ethernet/IEEE 802.3 interface.
2 Serial network interfaces.
1 ISDN Basic Rate interface.
32K bytes of non-volatile configuration memory.
8192K bytes of processor board System flash (Read ONLY)

Notice: NVRAM invalid, possibly due to write erase.
         --- System Configuration Dialog ---

At any point you may enter a question mark '?' for help.
Refer to the 'Getting Started' Guide for additional help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.
Would you like to enter the initial configuration dialog? [yes]:
```

Step 3 Press **Return** or enter **yes** to begin the configuration process.

Step 4 When the System Configuration Dialog asks whether you want to view the current interface summary, press **Return** or enter **yes**:

```
First, would you like to see the current interface summary? [yes]:

Any interface listed with OK? value "NO" does not have a valid
configuration

Interface     IP-Address      OK?   Method     Status     Protocol
Ethernet0     unassigned      NO    not set    up         down
BRI0          unassigned      NO    not set    up         up
Serial0       unassigned      NO    not set    down       down
Serial1       unassigned      NO    not set    down       down
```

Step 5 Configure the global parameters. Choose which protocols to support on the Ethernet interface. For IP installations, you can press **Return** to accept the default values (in brackets) for most of the questions. A typical configuration follows:

```
Configuring global parameters:

  Enter host name [Router]:
```

Next, you are prompted to enter an enable secret password. There are two types of privileged-level passwords:

- Enable secret password (a very secure, encrypted password)
- Enable password (a less secure, nonencrypted password)

The enable password is used when the enable secret password does not exist.

For maximum security, be sure the passwords are different. If you enter the same password for both, the router will accept your entry, but will display a warning message indicating that you should enter a different password.

Step 6 Enter an enable secret password:

```
The enable secret is a one-way cryptographic secret used
instead of the enable password when it exists.

  Enter enable secret: pail

The enable password is used when there is no enable secret
and when using older software and some boot images.
```

Step 7 Enter the enable and virtual terminal passwords:

```
Enter enable password: shovel
Enter virtual terminal password: vterm1
```

Step 8 Press **Return** to accept Simple Network Management Protocol (SNMP) management, or enter **no** to refuse it:

```
Configure SNMP Network Management? [yes]: no
```

Step 9 In the following example, the router is configured for AppleTalk, IP, and IPX. Configure the appropriate protocols for your router:

```
Configure Vines? [no]:
Configure LAT? [no]:
Configure AppleTalk? [no]: yes
  Multizone networks? [no]: yes
Configure DECnet? [no]:
Configure IP? [yes]:
  Configure IGRP routing? [yes]:
  Your IGRP autonomous system number [1]: 15
Configure CLNS? [no]:
Configure bridging? [no]:
Configure IPX? [no]: yes
Configure XNS? [no]:
Configure Apollo? [no]:
```

Step 10 Enter the ISDN BRI switch type for the router. The ISDN switch type appropriate for the router depends on the ISDN provider's equipment. Table 4-1 lists the ISDN switch types.

```
Enter ISDN BRI Switch Type [none]: basic-5ess
```

Table 4-1 ISDN Switch Types

Country	ISDN Switch Type	Description
Australia	basic-ts013	Australian TS013 switches
Europe	basic-1tr6	German 1TR6 ISDN switches
	basic-nwnet3	Norwegian NET3 ISDN switches (phase 1)
	basic-net3	NET3 ISDN switches (UK and others)
	vn2	French VN2 ISDN switches
	vn3	French VN3 ISDN switches
Japan	ntt	Japanese NTT ISDN switches
North America	basic-5ess	AT&T basic rate switches
	basic-dms100	NT DMS-100 basic rate switches
	basic-ni1	National ISDN-1 switches
New Zealand	basic-nznet3	New Zealand NET3 switches

Configuring the ISDN BRI Interface

This section explains how to configure the ISDN BRI interface. If an ISDN BRI WAN module is not installed in your router, skip this section and proceed with the next section, “Configuring the Ethernet or Token Ring Interfaces.”

The ISDN BRI interface is configured to allow connection to ISDN WANs. To configure the ISDN BRI interface, respond as follows (using your addresses and subnet mask) to the setup prompts, substituting the correct addresses and host names as appropriate:

```
Configuring interface BRI0:
Is this interface in use? [yes]
Configure IP on this interface? [yes]
IP address for this interface: 172.16.71.1
Number of bits in subnet field [0]: 8
lass B network is 172.16.0.0, 8 subnet bits; mask is
    255.255.255.0
  Configure AppleTalk on this interface? [no]: yes
    Extended AppleTalk network? [no]: yes
    AppleTalk starting cable range [0]: 1
    AppleTalk ending cable range [1]: 2
    AppleTalk zone name [myzone]:
    AppleTalk additional zone name: otherzone
    AppleTalk additional zone name:
  Configure IPX on this interface? [no]: yes
    IPX network number [1]: B000
```

Configuring the Ethernet or Token Ring Interfaces

Take the following steps to configure the Ethernet or Token Ring interface to allow communication over a LAN. To configure the interface parameters, you need to know your Ethernet or Token Ring interface network addresses. In this example, the system is being configured for an Ethernet LAN using IP.

Step 1 Respond as follows (using your addresses and subnet mask) to the setup prompts, substituting the correct addresses and host names as appropriate:

```
Configuring interface Ethernet0:
  Is this interface in use? [yes]:
  Configure IP on this interface? [yes]:
    IP address for this interface: 172.16.72.1
    Number of bits in subnet field [8]: 8
    Class B network is 172.16.0.0, 8 subnet bits; mask is
    255.255.255.0
```

Step 2 Enter **yes** if you will be using AppleTalk on the interface. Enter **yes** to configure the router for extended AppleTalk networks, and then enter the cable range. Enter the zone name, and any other additional zones that will be associated with your local zone:

```
Configure AppleTalk on this interface? [no]: yes
  Extended AppleTalk network? [no]: yes
  AppleTalk starting cable range [0]: 3
  AppleTalk ending cable range [1]: 3
  AppleTalk zone name [myzone]:
  AppleTalk additional zone name: otherzone
  AppleTalk additional zone name:
```

Step 3 Determine if you are going to enable IPX on the interface. If so, enter **yes** and then enter the unique IPX network number:

```
Configure IPX on this interface? [no]: yes
  IPX network number [1]: B001
```

Configuring the Synchronous Serial Interfaces

The synchronous serial interfaces are configured to allow connection to WANs. Once the Ethernet or Token Ting port on your router has been configured, take the following steps to configure the synchronous serial interfaces:

Step 1 Press **Return** or enter **yes** to configure serial port 0:

```
Configuring interface Serial0:
  Is this interface in use? [yes]:
```

Step 2 Determine which protocols you want on the synchronous serial interface and enter the appropriate responses. In this example, the system is being configured for IP, AppleTalk, and IPX:

```
Configure IP on this interface? [yes]:
Configure IP unnumbered on this interface? [no]:
  IP address for this interface: 172.16.73.1
  Number of bits in subnet field [8]:
  Class B network is 172.16.0.0, 8 subnet bits; mask is
  255.255.255.0
Configure AppleTalk on this interface? [no]: yes
  Extended AppleTalk network? [yes]:
  AppleTalk starting cable range [2]: 4
```

```
    AppleTalk ending cable range [3]: 4
    AppleTalk zone name [myzone]: ZZ Serial
    AppleTalk additional zone name:
  Configure IPX on this interface? [no]: yes
    IPX network number [2]: B002
```

Step 3 Configure the second synchronous serial interface, for example, as follows:

```
Configuring interface Serial1:
  Is this interface in use? [yes]:
  Configure IP on this interface? [yes]:
  Configure IP unnumbered on this interface? [no]:
    IP address for this interface: 172.16.74.2
    Number of bits in subnet field [8]:
    Class B network is 172.16.0.0, 8 subnet bits; mask is
    255.255.255.0
  Configure AppleTalk on this interface? [no]: yes
    AppleTalk starting cable range [3]: 5
    AppleTalk ending cable range [4]: 5
    AppleTalk zone name [myzone]: ZZ Serial
    AppleTalk additional zone name:
  Configure IPX on this interface? [no]: yes
    IPX network number [3]: B003
```

Step 4 The configuration you enter is now displayed and you are asked if you want to use the displayed configuration. If you enter **no**, you will lose the configuration information you just entered and you can begin the configuration again. If you enter **yes**, the configuration will be entered and saved in the startup configuration:

```
Use this configuration? [yes/no]: yes
Building configuration...
Use the enabled mode 'configure' command to modify this
configuration.


Press RETURN to get started!
```

Configuring ISDN

If you have an ISDN BRI WAN module, configure the BRI port for ISDN. This section explains typical ISDN configurations for one or two B channels. In the examples that follow, the BRI port is configured for IP routing, Challenge Handshake Authentication Protocol (CHAP), and Point-to-Point Protocol (PPP) encapsulation.

Take the following steps to configure the router for a basic ISDN PPP connection on a single B channel or two B channels, substituting the correct addresses and host names as appropriate for your network:

Step 1 Enter enable mode:

```
Router> enable
password: enablepassword
```

Step 2 Enter the **configure terminal** command. Then enter the host name and password that the router will use for CHAP caller identification:

```
Router# config term
Router (config)# username targetrouter password abc
```

Note The username and password must match the username and password already set on the router to which the ISDN connection will be made. The username and password are case sensitive.

Step 3 If you have not already done so, enter the **isdn switch-type** command to configure the ISDN switch type:

```
router (config)# isdn switch-type switch-type
```

Refer to Table 4-1 earlier in this chapter for a list of ISDN switch types.

Step 4 Enter the BRI interface, encapsulation method (PPP), authentication type, target router's IP address and ISDN number to dial, and the dialer group number:

```
Router (config)# interface bri port_number
Router (config-if)# encapsulation ppp
Router (config-if)# ppp authentication chap
Router (config-if)# dialer map ip targetrouter_ipaddress
targetrouter_phonenumber
Router (config-if)# dialer-group groupnumber
```

Note Do not use periods or hyphens when you enter dialing numbers.

Step 5 Some ISDN switch types, such as Basic NI1 or DMS-100 switch service, require you to configure a service profile identifier (SPID). Enter the SPID information as follows, substituting the appropriate entries for your installation:

```
Router (config-if)# isdn spid1 SPID_no phone_number
Router (config-if)# isdn spid2 SPID_no phone_number
```

Step 6 To set up a second B channel for bandwidth on demand, enter the **load-threshold** command to set the ISDN load threshold. The load threshold determines the percentage of network loading at which the second ISDN B channel is triggered. The value ranges from 1 to 255 (100 percent).

```
Router (config-if)# dialer load-threshold 128
```

In this example, the value of 128 means that when the first B channel reaches 50 percent of its bandwidth capacity (128 equals 50 percent of 255), the second B channel will be activated to assist with the bandwidth load.

Step 7 Enter the **access-list** command to configure the ISDN line to come up whenever IP packets are to be sent:

```
Router (config-if)# access-list access-list-number permit ip
sourcerouter-ipnetwork sourcerouter-subnetmask
targetrouter-ipnetwork targetrouter-subnetmask
Router (config)# dialer-list groupnumber list access-list-number
```

Step 8 Configure a static route to allow connectivity to the target router's local network. Enter the network number of the target router's local IP network and subnet mask, and the IP address of the target router's BRI port.

```
Router (config)# ip route targetrouter_ipnetwork subnetmask
targetBRIport_ipaddress
```

Step 9 Enter the **exit** command to exit configuration mode.

Step 10 Enter the **copy running-config startup-config** command to save the configuration to NVRAM.

Configuring Switched 56

This section explains how to configure the 2-wire switched 56-kbps and 4-wire 56/64-kbps DSU/CSU WAN modules for switched 56-kbps circuit-switched service.

You can configure the 2-wire switched 56-kbps DSU/CSU WAN module for switched 56-kbps service, but not Digital Data System ([DDS], which are leased or dedicated lines). The 4-wire 56/64-kbps DSU/CSU WAN module is configured for DDS as the factory default, but it can be configured for either switched 56/64-kbps service or DDS. (See the next section, "Configuring DDS.")

For Cisco IOS Release 11.0 and earlier releases, refer to the *Router Products Command Reference* for more information about the commands in this section. For Cisco IOS Release 11.1 and later releases, refer to the *Configuration Fundamentals Command Reference*.

Take the following steps to configure the 2-wire switched 56-kbps and 4-wire 56/64-kbps DSU/CSU WAN module for circuit-switched service, substituting the correct addresses and host names as appropriate for your network:

Step 1 Enter enable mode:

```
Router> enable
password: enablepassword
```

Step 2 Enter configuration mode:

```
Router# config term
Router(config)#
```

Step 3 Assign an IP address to the serial port on the module:

```
Router(config)# interface serial port_number
Router(config-if)# ip address ipaddress subnetmask
Router(config-if)# no keepalive
```

Step 4 If you have a 2-wire switched 56-kbps WAN module, skip this step and proceed to Step 5. If you have a 4-wire 56/64-kbps DSU/CSU WAN module, set the network type to switched as follows:

```
Router(config-if)# service-module 56k network-type switched
```

Step 5 Set the carrier type, where *carrier* can be **att**, **sprint**, or **other**:

```
Router(config-if)# service-module 56k switched-carrier carrier
```

Step 6 Enter the dialer information:

```
Router(config-if)# dialer in-band
Router(config-if)# dialer string targetrouter_phonenumber
Router(config-if)# dialer-group groupnumber
Router(config-if)# exit
Router(config)# dialer-list groupnumber protocol protocol permit
Router(config)#
```

Step 7 Return to user EXEC mode:

```
Router(config)# exit
Router# exit
Router>
```

Configuring DDS

The 4-wire 56/64-kbps DSU/CSU WAN module is configured for DDS (which are leased or dedicated lines) as the factory default, but it can be configured for either switched 56/64-kbps service or DDS. The DDS configuration is described in this section. To configure the 4-wire 56/64-kbps DSU/CSU WAN module for circuit-switched service, follow the instructions in the previous section, “Configuring Switched 56.”

For Cisco IOS Release 11.0 and earlier releases, refer to the *Router Products Command Reference* for more information about the commands in this section. For Cisco IOS Release 11.1 and later releases, refer to the *Configuration Fundamentals Command Reference*.

Take the following steps to configure the 4-wire 56/64-kbps DSU/CSU WAN module for DDS, substituting the correct addresses and host names as appropriate for your network:

Step 1 Enter enable mode:

```
Router> enable
password: enablepassword
```

Step 2 Enter configuration mode:

```
Router# config term
Router(config)#
```

Step 3 Assign an IP address to the serial port on the module:

```
Router(config)# interface serial port_number
Router(config-if)# ip address ipaddress subnetmask
Router(config-if)# no keepalive
```

Step 4 Set the network type to DDS:

```
Router(config-if)# service-module 56k network-type dds
```

Step 5 Return to user EXEC mode:

```
Router(config-if)# exit
Router(config)# exit
Router# exit
Router>
```

Configuring the Fractional T1/T1 DSU/CSU WAN Module

This section describes how to configure the fractional T1/T1 DSU/CSU WAN module. This module is configured for Extended Superframe Format (ESF) signal format, bipolar eight zero substitution (B8ZS), and full bandwidth as the factory default. Depending on your networking environment, you might need to change these settings.

For Cisco IOS Release 11.0 and earlier releases, refer to the *Router Products Command Reference* for more information about the commands in this section. For Cisco IOS Release 11.1 and later releases, refer to the *Configuration Fundamentals Command Reference*.

Take the following steps to configure the fractional T1/T1 DSU/CSU WAN module for a typical leased-line connection, substituting the correct addresses and host names as appropriate for your network:

Step 1 Enter enable mode:

```
Router> enable
password: enablepassword
```

Step 2 Enter configuration mode:

```
Router# config term
Router(config)#
```

Step 3 Assign an IP address to the serial port on the module:

```
Router(config)# interface serial port_number
Router(config-if)# ip address ipaddress subnetmask
Router(config-if)# no keepalive
```

Step 4 Enter the framing type and line code type, substituting *framing_type* with **sf** (Superframe) or **esf (**Extended Superframe**)** and *linecode_type* with **ami** (alternate mark inversion) or **b8zs (**bipolar eight zero substitution**)**:

```
Router(config-if)# service-module t1 framing framing_type
Router(config-if)# service-module t1 linecode linecode_type
```

Step 5 If you are using fractional T1 service, enter the time slot range and speed. In the following example, the time slot range is from 1 to 20 and the speed is 64-kbps:

```
Router(config-if)# service-module t1 timeslots 1-20 speed 64
```

Step 6 Return to user EXEC mode:

```
Router(config-if)# exit
Router(config)# exit
Router# exit
Router>
```

Specifying the Boot Method

You can enter multiple boot commands in the configuration in NVRAM to provide a backup method for loading the Cisco IOS image onto the router. The router boots using the first boot command that succeeds. If you enter multiple boot commands, the router executes them in the order they are entered. There are two ways to load the Cisco IOS image: from Flash memory or from a TFTP server on the network.

1 Flash memory

Information stored in Flash memory is not vulnerable to network failures that might occur when you load system software from servers. In the following example, replace *filename* with the filename of the Cisco IOS image:

```
Router> enable
Password: enablepassword
Router# configure terminal
Router (config)# boot system flash filename
Router (config)# Ctrl-Z
Router# copy running-config startup-config
Building configuration ...
[OK]
Router# exit
Router>
```

2 TFTP server

If Flash memory is not available, or if Flash memory does not contain a valid Cisco IOS image, you can specify that system software be loaded from a TFTP server on your network as a backup boot method for the router. In the following example, replace *filename* with the filename of the Cisco IOS image, and replace *ipaddress* with the IP address of the TFTP server:

```
Router> enable
Password: enablepassword
Router# configure terminal
Router (config)# boot system tftp filename ipaddress
Router (config)# Ctrl-Z
Router# copy running-config startup-config
Building configuration ...
[OK]
Router# exit
Router>
```

For more information about the **configure terminal** command, refer to the *Router Products Configuration Guide* publication for Cisco IOS Release 11.0 and earlier releases. Refer to the *Configuration Fundamentals Configuration Guide* for Cisco IOS Release 11.1 and later releases.

Checking the Configuration Settings

Enter the **show version** command to check the software version (third line from the top in the following display) and configuration register setting (at the end of the following display):

```
Router> show version
Cisco Internetwork Operating System Software
IOS (tm) XX00 Software (XXX-X-X), RELEASE SOFTWARE XX.X(XXXX) [XXX]
Copyright (c) 1986-1996 by Cisco Systems, Inc.
Compiled Tue XX-XXX-XX 13:07 by XXXXX
Image text-base: 0x03032810, data-base: 0x00001000

ROM: System Bootstrap, Version X.X(XXXX) [XXXXX], RELEASE SOFTWARE
ROM: XX00 Bootstrap Software (XXX-BOOT-X), Version XX.X(XXXXX) [XXXXX]

Router uptime is 4 minutes
System restarted by power-on
System image file is "flash:XXX/XXX-X-X.Nov14", booted via flash

Cisco XXXX(68030) processor (revision X) with 4092K/2048K bytes of memory.
Processor board ID 00000000
Bridging software.
SuperLAT software copyright 199X by Meridian Technology Corp).
X.25 software, Version X.X, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 199X by TGV Inc).
1 Ethernet/IEEE 802.3 interface.
2 Serial network interfaces.
No module installed for Serial Interface 0
No module installed for Serial Interface 1
32K bytes of non-volatile configuration memory.
8192K bytes of processor board System flash (Read ONLY)

Configuration register is 0x2102

Router>
```

Getting More Information

For more information about router software configuration, refer to the following publications for Cisco IOS Release 11.0 and earlier:

- *Internetworking Technology Overview*
- *Router Products Configuration Guide*
- *Router Products Command Reference*
- *Configuration Builder Getting Started Guide*
- *CiscoWorks for Windows Getting Started Guide*
- *Troubleshooting Internetworking Systems* (as needed)

For Cisco IOS Release 11.1 and later, refer to the following publications:

- *Internetworking Technology Overview*
- *Configuration Fundamentals Configuration Guide*
- *Configuration Fundamentals Command Reference*
- *Remote Node and Terminal Services Configuration Guide*
- *Remote Node and Terminal Services Command Reference*
- *Wide-Area Networking Configuration Guide*
- *Wide-Area Networking Command Reference*
- *Standard Network Protocols Configuration Guide*
- *Standard Network Protocols Command Reference*
- *Network Protocols Configuration Guide*
- *Network Protocols Command Reference*

These publications are available on UniverCD, Cisco's online library of product information. To order UniverCD, or paper documentation, refer to the *Cisco Information Packet* publication that accompanied your router.

APPENDIX C

Cabling Specifications for the Cisco 2524 and Cisco 2525 Routers

This appendix provides the following pinout information:

- Console and Auxiliary Port Signals and Pinouts
- Ethernet Cable Assembly and Pinouts
- Token Ring Port Pinouts
- 2-Wire Switched 56-kbps DSU/CSU Module Port Pinouts
- 4-Wire 56/64-kbps DSU/CSU Module Port Pinouts
- Fractional T1/T1 DSU/CSU Module Port Pinouts
- Synchronous Serial Cable Assemblies and Pinouts
- ISDN BRI Port and Cable Pinouts

Note All pins not listed in the tables in this appendix are not connected.

Console and Auxiliary Port Signals and Pinouts

Your router comes with a console and auxiliary cable kit, which contains the cable and adapters you need to connect a console (an ASCII terminal or PC running terminal emulation software) or modem to your router. The console and auxiliary cable kit includes the following items:

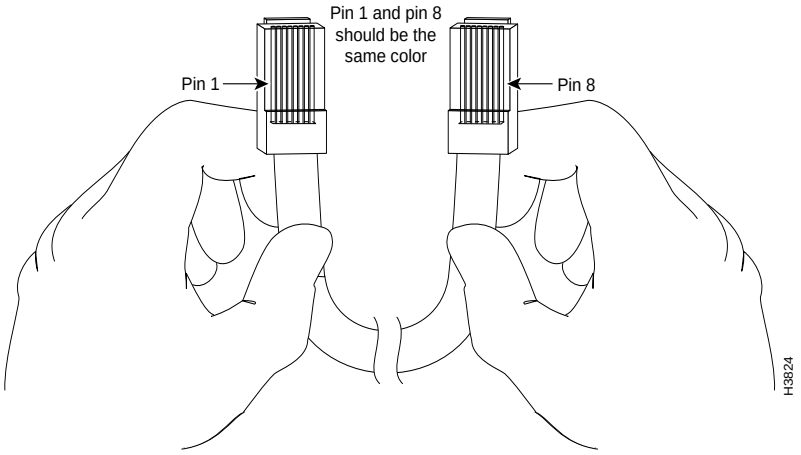
- RJ-45-to-RJ-45 roll-over cable. (See the next section, “Identifying a Roll-Over Cable,” for more information.)
- RJ-45-to-DB-9 female DTE adapter (labeled Terminal).
- RJ-45-to-DB-25 female DTE adapter (labeled Terminal).
- RJ-45-to-DB-25 male DCE adapter (labeled Modem).

For console connections, proceed to the section “Console Port Signals and Pinouts” later in this appendix; for modem connections, proceed to the section “Auxiliary Port Signals and Pinouts” later in this appendix.

Identifying a Roll-Over Cable

You can identify a roll-over cable by comparing the two modular ends of the cable. Holding the cables side-by-side, with the tab at the back, the wire connected to the pin on the outside of the left plug should be the same color as the wire connected to the pin on the outside of the right plug. (See Figure C-1.) If your cable was purchased from Cisco Systems, pin 1 will be white on one connector, and pin 8 will be white on the other (a roll-over cable reverses pins 1 and 8, 2 and 7, 3 and 6, and 4 and 5).

Figure C-1 Identifying a Roll-Over Cable



Console Port Signals and Pinouts

Use the RJ-45-to-RJ-45 roll-over cable and RJ-45-to-DB-9 female DTE adapter (labeled Terminal) to connect the console port to a PC running terminal emulation software. Figure C-2 shows how to connect the console port to a PC. Table C-1 lists the pinouts for the asynchronous serial console port, the RJ-45-to-RJ-45 roll-over cable, and the RJ-45-to-DB-9 female DTE adapter (labeled Terminal).

Figure C-2 Connecting the Console Port to a PC

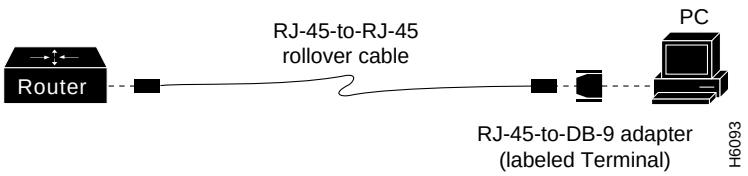


Table C-1 Console Port Signaling and Cabling Using a DB-9 Adapter

Console Port (DTE)	RJ-45-to-RJ-45 Roll-Over Cable		RJ-45-to-DB-9 Terminal Adapter	Console Device
Signal	**RJ-45 Pin**	**RJ-45 Pin**	**DB-9 Pin**	**Signal**
RTS	1[1]	8	8	CTS
DTR	2	7	6	DSR
TxD	3	6	2	RxD
GND	4	5	5	GND
GND	5	4	5	GND
RxD	6	3	3	TxD
DSR	7	3	4	DTR
CTS	8[1]	1	7	RTS

1. Pin 1 is connected internally to Pin 8.

Use the RJ-45-to-RJ-45 roll-over cable and RJ-45-to-DB-25 female DTE adapter (labeled Terminal) to connect the console port to a terminal. Figure C-3 shows how to connect the console port to a terminal. Table C-2 lists the pinouts for the asynchronous serial console port, the RJ-45-to-RJ-45 roll-over cable, and the RJ-45-to-DB-25 female DTE adapter (labeled Terminal).

Figure C-3 Connecting a the Console Port to a Terminal

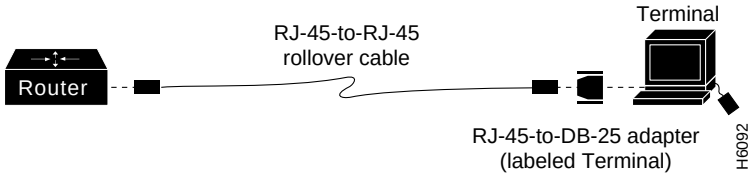


Table C-2 Console Port Signaling and Cabling Using a DB-25 Adapter

Console Port (DTE)[1]	RJ-45-to-RJ-45 Roll-Over Cable		RJ-45-to-DB-25 Terminal Adapter	Console Device
Signal	**RJ-45 Pin**	**RJ-45 Pin**	**DB-25 Pin**	**Signal**
RTS	1[2]	8	5	CTS
DTR	2	7	6	DSR
TxD	3	6	3	RxD
GND	4	5	7	GND
GND	5	4	7	GND
RxD	6	3	2	TxD
DSR	7	3	20	DTR
CTS	8[1]	1	4	RTS

1. You can use the same cabling to connect a console to the auxiliary port.
2. Pin 1 is connected internally to Pin 8.

Auxiliary Port Signals and Pinouts

Use the RJ-45-to-RJ-45 roll-over cable and RJ-45-to-DB-25 male DCE adapter (labeled Modem) to connect the auxiliary port to a modem. Figure C-4 shows how to connect the auxiliary port to a modem. Table C-3 lists the pinouts for the asynchronous serial auxiliary port, the RJ-45-to-RJ-45 roll-over cable, and the RJ-45-to-DB-25 male DCE adapter (labeled Modem).

Figure C-4 Connecting the Auxiliary Port to a Modem

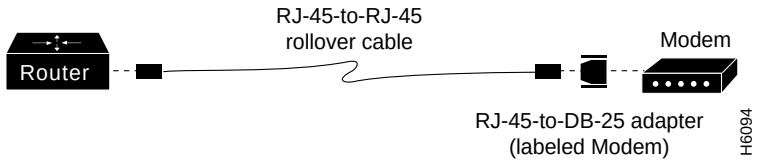


Table C-3 Auxiliary Port Signaling and Cabling Using a DB-25 Adapter

AUX Port (DTE)	RJ-45-to-RJ-45 Roll-Over Cable		RJ-45-to-DB-25 Modem Adapter	Modem
Signal	**RJ-45 Pin**	**RJ-45 Pin**	**DB-25 Pin**	**Signal**
RTS	1[1]	8	4	RTS
DTR	2	7	20	DTR
TxD	3	6	3	TxD
GND	4	5	7	GND
GND	5	4	7	GND
RxD	6	3	2	RxD
DSR	7	3	8	DCD
CTS	8[1]	1	5	CTS

1. Pin 1 is connected internally to Pin 8.

Ethernet Cable Assembly and Pinouts

This section describes the pinouts for the Ethernet ports and cables.

Figure C-5 shows an Ethernet (AUI) cable assembly, and Table C-4 lists an AUI cable pinout.

Figure C-5 Ethernet (AUI) Cable Assembly

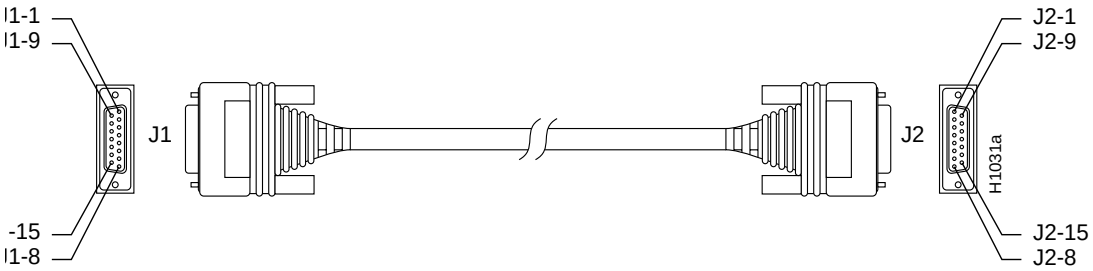


Table C-4 Ethernet (AUI) Cable Pinouts (DB-15)

Pin	Ethernet Circuit	Signal
3	DO-A	Data Out Circuit A
10	DO-B	Data Out Circuit B
11	DO-S	Data Out Circuit Shield
5	DI-A	Data In Circuit A
12	DI-B	Data In Circuit B
4	DI-S	Data In Circuit Shield
2	CI-A	Control In Circuit A
9	CI-B	Control In Circuit B
1	CI-S	Control In Circuit Shield
6	VC	Voltage Common
13	VP	Voltage Plus
14	VS	Voltage Shield (L25 and M25)
Shell	PG	Protective Ground

Table C-5 lists the pinouts for the 10BaseT port. Table C-6 and Table C-7 list the pinouts for the cables you can use with the 10BaseT port.

Table C-5 10BaseT Ethernet Port (RJ-45) Pinouts

Pin	Description
1	TX+
2	TX–
3	RX+
4	–
5	–
6	RX–

Pin	Description
7	–
8	–

Table C-6 RJ-45-to-RJ-45 Straight-Through Ethernet Cable Pinouts

RJ-45 Pin	Signal	Direction	RJ-45 Pin
1	TX+	–>	1
2	TX–	–>	2
3	RX+	<–	3
4	–	–	4
5	–	–	5
6	RX–	<–	6
7	–	–	7
8	–	–	8

Table C-7 RJ-45-to-RJ-45 Crossover Ethernet Cable Pinouts

RJ-45 Pin	Signal	Direction	RJ-45 Pin	Signal
1	TX+	–>	3	RX+
2	TX–	–>	6	RX–
3	RX+	<–	1	TX+
4	–	–	4	–
5	–	–	5	–
6	RX–	<–	2	TX–
7	–	–	7	–
8	–	–	8	–

Token Ring Port Pinouts

Table C-8 lists the Token Ring port pinouts. Use a Token Ring lobe cable to connect the Token Ring port to a MAU.

Table C-8 Token Ring Port (DB-9) Pinouts

9 Pin[1]	Signal
1	Receive
3	+5V[2]
5	Transmit
6	Receive
9	Transmit

1. Pins 2, 4, 7, and 8 are ground.
2. 600 mA maximum.

2-Wire Switched 56-kbps DSU/CSU Module Port Pinouts

Table C-9 lists the port pinouts for the 2-wire switched 56 DSU/CSU module. Use a straight-through RJ-11-to-RJ-11 cable to connect the 2-wire switched 56 port to an RJ-11 jack.

Table C-9 2-Wire Switched 56-kbps DSU/CSU Module Port (RJ-11) Pinouts

RJ-11 6 Pin[1]	Signal
3	Tip
4	Ring

1. Pins 1, 2, 5, and 6 are not used.

4-Wire 56/64-kbps DSU/CSU Module Port Pinouts

Table C-10 lists the port pinouts for the 4-wire 56/64-kbps DSU/CSU module. Use a straight-through RJ-48S-to-RJ-48S cable to connect the RJ-48S port to an RJ-48S jack.

Table C-10 4-Wire 56/64-kbps DSU/CSU Module Port (RJ-48S) Pinouts

RJ-48S 8 Pin[1]	Signal
1	Receive ring
2	Receive tip
7	Ring
8	Tip

1. Pins 3, 4, 5, and 6 are not used.

Fractional T1/T1 DSU/CSU Module Port Pinouts

Table C-11 lists the fractional T1/T1 DSU/CSU module port pinouts. Use a straight-through RJ-48C-to-RJ-48C cable to connect the fractional T1/T1 port to an RJ-48C jack.

Table C-11 Fractional T1/T1 DSU/CSU Module Port (RJ-48C) Pinouts

RJ-48C 8 Pin[1]	Description
1	Receive ring
2	Receive tip
4	Ring
5	Tip

1. Pins 3, 6, 7, and 8 are not used.

Synchronous Serial Cable Assemblies and Pinouts

The illustrations and tables in this section provide assembly drawings and pinouts for the EIA-530 DCE, EIA/TIA-232, EIA/TIA-449, V.35, and X.21 DTE and DCE cables, which are used with the five-in-one synchronous serial WAN module.

EIA-530

Figure C-6 shows the EIA-530 serial cable assembly, and Table C-12 lists the pinouts. Arrows indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.

Figure C-6 EIA-530 Serial Cable Assembly

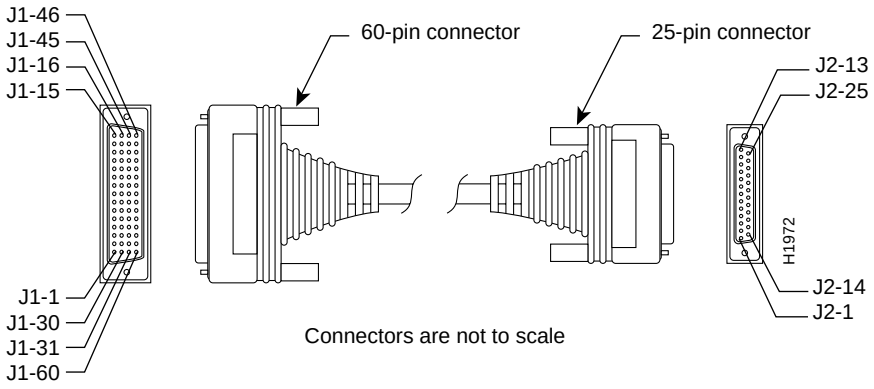


Table C-12 EIA-530 DTE Cable Pinouts (DB-60 to DB-25)

60 Pin	Signal	25 Pin	Signal	Direction DTE DCE[1]
J1-11	TxD/RxD+	J2-2	BA(A), TxD+	—>
J1-12	TxD/RxD–	J2-14	BA(B), TxD–	—>
J1-28	RxD/TxD+	J2-3	BB(A), RxD+	<—
J1-27	RxD/TxD–	J2-16	BB(B), RxD–	<—

60 Pin	Signal	25 Pin	Signal	Direction DTE DCE[1]
J1-9	RTS/CTS+	J2-4	CA(A), RTS+	—>
J1-10	RTS/CTS–	J2-19	CA(B), RTS–	—>
J1-1	CTS/RTS+	J2-5	CB(A), CTS+	<—
J1-2	CTS/RTS–	J2-13	CB(B), CTS–	<—
J1-3	DSR/DTR+	J2-6	CC(A), DSR+	<—
J1-4	DSR/DTR–	J2-22	CC(B), DSR–	<—
J1-46	Shield_GND	J2-1	Shield	Shorted
J1-47	MODE_2	–	–	
J1-48	GND	–	–	Shorted
J1-49	MODE_1	–	–	
J1-5	DCD/DCD+	J2-8	CF(A), DCD+	<—
J1-6	DCD/DCD–	J2-10	CF(B), DCD–	<—
J1-24	TxC/RxC+	J2-15	DB(A), TxC+	<—
J1-23	TxC/RxC–	J2-12	DB(B), TxC–	<—
J1-26	RxC/TxCE+	J2-17	DD(A), RxC+	<—
J1-25	RxC/TxCE–	J2-9	DD(B), RxC–	<—
J1-44	LL/DCD	J2-18	LL	—>
J1-45	Circuit_GND	J2-7	Circuit_ GND	–
J1-7	DTR/DSR+	J2-20	CD(A), DTR+	—>
J1-8	DTR/DSR–	J2-23	CD(B), DTR–	—>
J1-13	TxCE/TxC+	J2-24	DA(A), TxCE+	—>
J1-14	TxCE/TxC–	J2-11	DA(B), TxCE–	—>

1. The EIA-530 interface cannot be operated in DCE mode. A DCE cable is not available for the EIA-530 interface.

EIA/TIA-232

Figure C-7 shows the EIA/TIA-232 cable assembly. Table C-13 lists the DTE pinouts. Table C-14 lists the DCE pinouts. Arrows indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.

Figure C-7 EIA/TIA-232 Cable Assembly

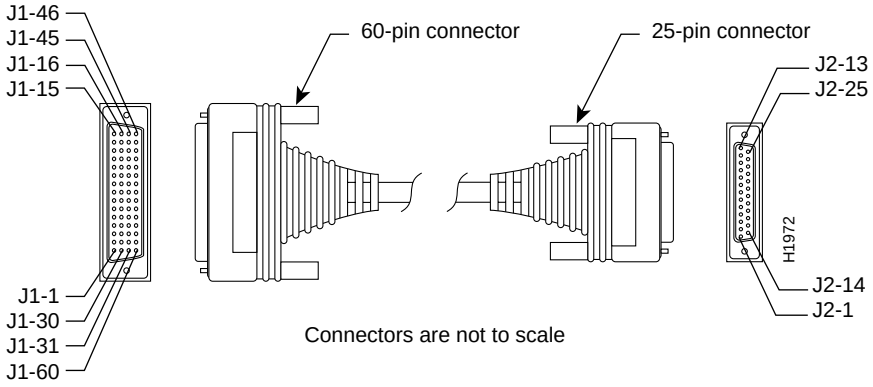


Table C-13 EIA/TIA-232 DTE Cable Pinouts (DB-60 to DB-25)

60 Pin	Signal	Description	Direction	25 Pin	Signal
J1-50 J1-51 J1-52	MODE_0 GND MODE_DCE	Shorting group	–	–	–
J1-46	Shield GND	Single	–	J2-1	Shield GND
J1-41 Shield	TxD/RxD –	Twisted pair no. 5	—> –	J2-2 Shield	TxD –
J1-36 Shield	RxD/TxD –	Twisted pair no. 9	<— –	J2-3 Shield	RxD –
J1-42 Shield	RTS/CTS –	Twisted pair no. 4	—> –	J2-4 Shield	RTS –

60 Pin	Signal	Description	Direction	25 Pin	Signal
J1-35 Shield	CTS/RTS –	Twisted pair no. 10	<— –	J2-5 Shield	CTS –
J1-34 Shield	DSR/DTR –	Twisted pair no. 11	<— –	J2-6 Shield	DSR –
J1-45 Shield	Circuit GND –	Twisted pair no. 1	– –	J2-7 Shield	Circuit GND –
J1-33 Shield	DCD/LL –	Twisted pair no. 12	<— –	J2-8 Shield	DCD –
J1-37 Shield	TxC/NIL –	Twisted pair no. 8	<— –	J2-15 Shield	TxC –
J1-38 Shield	RxC/TxCE –	Twisted pair no. 7	<— –	J2-17 Shield	RxC –
J1-44 Shield	LL/DCD –	Twisted pair no. 2	—> –	J2-18 Shield	LTST –
J1-43 Shield	DTR/DSR –	Twisted pair no. 3	—> –	J2-20 Shield	DTR –
J1-39 Shield	TxCE/TxC –	Twisted pair no. 6	—> –	J2-24 Shield	TxCE –

Table C-14 EIA/TIA-232 DCE Cable Pinouts (DB-60 to DB-25)

60 Pin	Signal	Description	Direction	25 Pin	Signal
J1-50 J1-51	MODE_0 GND	Shorting group	–	–	–
J1-46	Shield GND	Single	–	J2-1	Shield GND
J1-36 Shield	RxD/TxD –	Twisted pair no. 9	<— –	J2-2 Shield	TxD –
J1-41 Shield	TxD/RxD –	Twisted pair no. 5	—> –	J2-3 Shield	RxD –
J1-35 Shield	CTS/RTS –	Twisted pair no. 10	<— –	J2-4 Shield	RTS –

60 Pin	Signal	Description	Direction	25 Pin	Signal
J1-42	RTS/CTS	Twisted pair no. 4	—>	J2-5	CTS
Shield	–		–	Shield	–
J1-43	DTR/DSR	Twisted pair no. 3	—>	J2-6	DSR
Shield	–		–	Shield	–
J1-45	Circuit GND	Twisted pair no. 1	–	J2-7	Circuit GND
Shield	–		–	Shield	
J1-44	LL/DCD	Twisted pair no. 2	—>	J2-8	DCD
Shield	–		–	Shield	–
J1-39	TxCE/TxC	Twisted pair no. 7	—>	J2-15	TxC
Shield	–		–	Shield	–
J1-40	NIL/RxC	Twisted pair no. 6	—>	J2-17	RxC
Shield	–		–	Shield	–
J1-33	DCD/LL	Twisted pair no. 12	<—	J2-18	LTST
Shield	–		–	Shield	–
J1-34	DSR/DTR	Twisted pair no. 11	<—	J2-20	DTR
Shield	–		–	Shield	–
J1-38	RxC/TxCE	Twisted pair no. 8	<—	J2-24	TxCE
Shield	–		–	Shield	–

EIA/TIA-449

Figure C-8 shows the EIA/TIA-449 cable assembly. Table C-15 lists the DTE pinouts. Table C-16 lists the DCE pinouts. Arrows indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.

Figure C-8 EIA/TIA-449 Cable Assembly

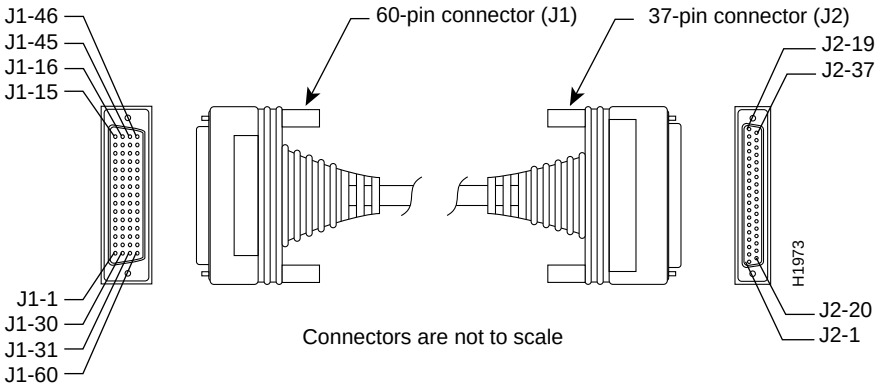


Table C-15 EIA/TIA-449 DTE Cable Pinouts (DB-60 to DB-37)

60 Pin	Signal	Description	Direction	37 Pin	Signal
J1-49 J1-48	MODE_1 GND	Shorting group	–	–	–
J1-51 J1-52	GND MODE_DCE	Shorting group	–	–	–
J1-46	Shield_GND	Single	_	J2-1	Shield GND
J1-11 J1-12	TxD/RxD+ TxD/RxD–	Twisted pair no. 6	—> —>	J2-4 J2-22	SD+ SD–
J1-24 J1-23	TxC/RxC+ TxC/RxC–	Twisted pair no. 9	<— <—	J2-5 J2-23	ST+ ST–
J1-28 J1-27	RxD/TxD+ RxD/TxD–	Twisted pair no. 11	<— <—	J2-6 J2-24	RD+ RD–
J1-9 J1-10	RTS/CTS+ RTS/CTS–	Twisted pair no. 5	—> —>	J2-7 J2-25	RS+ RS–
J1-26 J1-25	RxC/TxCE+ RxC/TxCE–	Twisted pair no. 10	<— <—	J2-8 J2-26	RT+ RT–

60 Pin	Signal	Description	Direction	37 Pin	Signal
J1-1	CTS/RTS+	Twisted pair no. 1	<—	J2-9	CS+
J1-2	CTS/RTS–		<—	J2-27	CS–
J1-44	LL/DCD	Twisted pair no. 12	—>	J2-10	LL
J1-45	Circuit_GND		_	J2-37	SC
J1-3	DSR/DTR+	Twisted pair no. 2	<—	J2-11	DM+
J1-4	DSR/DTR–		<—	J2-29	DM–
J1-7	DTR/DSR+	Twisted pair no. 4	—>	J2-12	TR+
J1-8	DTR/DSR–		—>	J2-30	TR–
J1-5	DCD/DCD+	Twisted pair no. 3	<—	J2-13	RR+
J1-6	DCD/DCD–		<—	J2-31	RR–
J1-13	TxCE/TxC+	Twisted pair no. 7	—>	J2-17	TT+
J1-14	TxCE/TxC–		—>	J2-35	TT–
J1-15	Circuit_GND	Twisted pair no. 9	–	J2-19	SG
J1-16	Circuit_GND		–	J2-20	RC

Table C-16 EIA/TIA-449 DCE Cable Pinouts (DB-60 to DB-37)

60 Pin	Signal	Description	Direction	37 Pin	Signal
J1-49	MODE_1	Shorting group	–	–	–
J1-48	GND				
J1-46	Shield_GND	Single	–	J2-1	Shield GND
J1-28	RxD/TxD+	Twisted pair no. 11	<—	J2-4	SD+
J1-27	RxD/TxD–		<—	J2-22	SD–
J1-13	TxCE/TxC+	Twisted pair no. 7	—>	J2-5	ST+
J1-14	TxCE/TxC–		—>	J2-23	ST–
J1-11	TxD/RxD+	Twisted pair no. 6	—>	J2-6	RD+
J1-12	TxD/RxD–		—>	J2-24	RD–
J1-1	CTS/RTS+	Twisted pair no. 1	<—	J2-7	RS+
J1-2	CTS/RTS–		<—	J2-25	RS–
J1-24	TxC/RxC+	Twisted pair no. 9	—>	J2-8	RT+
J1-23	TxC/RxC–		—>	J2-26	RT–

60 Pin	Signal	Description	Direction	37 Pin	Signal
J1-9	RTS/CTS+	Twisted pair no. 5	—>	J2-9	CS+
J1-10	RTS/CTS–		—>	J2-27	CS–
J1-29	NIL/LL	Twisted pair no. 12	—>	J2-10	LL
J1-30	Circuit_GND		–	J2-37	SC
J1-7	DTR/DSR+	Twisted pair no. 4	—>	J2-11	DM+
J1-8	DTR/DSR–		—>	J2-29	DM–
J1-3	DSR/DTR+	Twisted pair no. 2	<—	J2-12	TR+
J1-4	DSR/DTR–		<—	J2-30	TR–
J1-5	DCD/DCD+	Twisted pair no. 3	—>	J2-13	RR+
J1-6	DCD/DCD–		—>	J2-31	RR–
J1-26	RxC/TxCE+	Twisted pair no. 10	<—	J2-17	TT+
J1-25	RxC/TxCE–		<—	J2-35	TT–
J1-15	Circuit_GND	Twisted pair no. 8	_	J2-19	SG
J1-16	Circuit_GND		_	J2-20	RC

V.35

Figure C-9 shows the V.35 cable assembly. Table C-17 lists the DTE pinouts. Table C-18 lists the DCE pinouts. Arrows indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.

Figure C-9 V.35 Cable Assembly

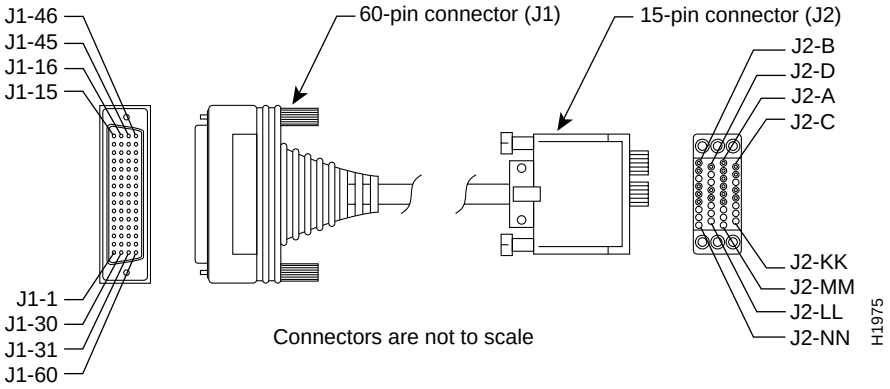


Table C-17 V.35 DTE Cable Pinouts (DB-60 to 34-Pin)

60 Pin	Signal	Description	Direction	34 Pin	Signal
J1-49 J1-48	MODE_1 GND	Shorting group	–	–	–
J1-50 J1-51 J1-52	MODE_0 GND MODE_DCE	Shorting group	–	–	–
J1-53 J1-54 J1-55 J1-56	TxC/NIL RxC_TxCE RxD/TxD GND	Shorting group	–	–	–
J1-46	Shield_GND	Single	–	J2-A	Frame GND
J1-45 Shield	Circuit_GND –	Twisted pair no. 12	– –	J2-B Shield	Circuit GND –
J1-42 Shield	RTS/CTS –	Twisted pair no. 9	—> –	J2-C Shield	RTS –
J1-35 Shield	CTS/RTS –	Twisted pair no. 8	<— –	J2-D Shield	CTS –

60 Pin	Signal	Description	Direction	34 Pin	Signal
J1-34 Shield	DSR/DTR –	Twisted pair no. 7	<— –	J2-E Shield	DSR –
J1-33 Shield	DCD/LL –	Twisted pair no. 6	<— –	J2-F Shield	RLSD –
J1-43 Shield	DTR/DSR –	Twisted pair no. 10	—> –	J2-H Shield	DTR –
J1-44 Shield	LL/DCD –	Twisted pair no. 11	—> –	J2-K Shield	LT –
J1-18 J1-17	TxD/RxD+ TxD/RxD–	Twisted pair no. 1	—> —>	J2-P J2-S	SD+ SD–
J1-28 J1-27	RxD/TxD+ RxD/TxD–	Twisted pair no. 5	<— <—	J2-R J2-T	RD+ RD–
J1-20 J1-19	TxCE/TxC+ TxCE/TxC–	Twisted pair no. 2	—> —>	J2-U J2-W	SCTE+ SCTE–
J1-26 J1-25	RxC/TxCE+ RxC/TxCE–	Twisted pair no. 4	<— <—	J2-V J2-X	SCR+ SCR–
J1-24 J1-23	TxC/RxC+ TxC/RxC–	Twisted pair no. 3	<— <—	J2-Y J2-AA	SCT+ SCT–

Table C-18 V.35 DCE Cable Pinouts (DB-60 to 34-Pin)

60 Pin	Signal	Description	Direction	34 Pin	Signal
J1-49 J1-48	MODE_1 GND	Shorting group	–	–	–
J1-50 J1-51	MODE_0 GND	Shorting group	–	–	–
J1-53 J1-54 J1-55 J1-56	TxC/NIL RxC_TxCE RxD/TxD GND	Shorting group	–	–	–
J1-46	Shield_GND	Single	–	J2-A	Frame GND

60 Pin	Signal	Description	Direction	34 Pin	Signal
J1-45 Shield	Circuit_GND –	Twisted pair no. 12	– –	J2-B Shield	Circuit GND –
J1-35 Shield	CTS/RTS –	Twisted pair no. 8	<— –	J2-C Shield	RTS –
J1-42 Shield	RTS/CTS –	Twisted pair no. 9	—> –	J2-D Shield	CTS –
J1-43 Shield	DTR/DSR –	Twisted pair no. 10	—> –	J2-E Shield	DSR –
J1-44 Shield	LL/DCD –	Twisted pair no. 11	—> –	J2-F Shield	RLSD –
J1-34 Shield	DSR/DTR –	Twisted pair no. 7	<— –	J2-H Shield	DTR –
J1-33 Shield	DCD/LL –	Twisted pair no. 6	<— –	J2-K Shield	LT –
J1-28 J1-27	RxD/TxD+ RxD/TxD–	Twisted pair no. 5	<— <—	J2-P J2-S	SD+ SD–
J1-18 J1-17	TxD/RxD+ TxD/RxD–	Twisted pair no. 1	—> —>	J2-R J2-T	RD+ RD–
J1-26 J1-25	RxC/TxCE+ RxC/TxCE–	Twisted pair no. 4	<— <—	J2-U J2-W	SCTE+ SCTE–
J1-22 J1-21	NIL/RxC+ NIL/RxC–	Twisted pair no. 3	—> —>	J2-V J2-X	SCR+ SCR–
J1-20 J1-19	TxCE/TxC+ TxCE/TxC–	Twisted pair no. 2	—> —>	J2-Y J2-AA	SCT+ SCT–

X.21

Figure C-10 shows the X.21 cable assembly. Table C-19 lists the DTE pinouts. Table C-20 lists the DCE pinouts. Arrows indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.

Figure C-10 X.21 Cable Assembly

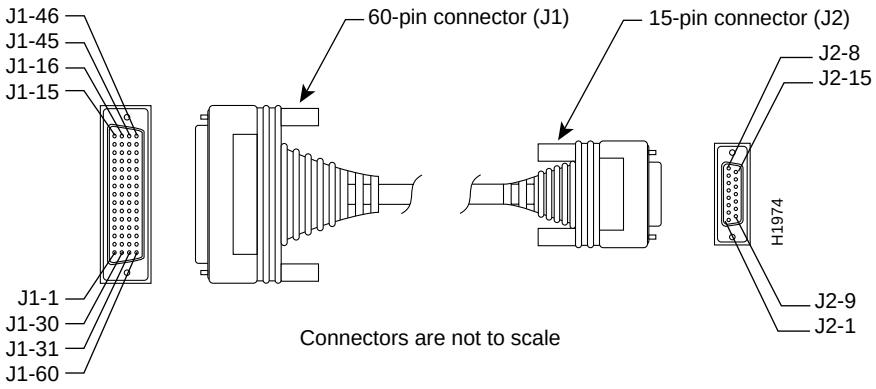


Table C-19 X.21 DTE Cable Pinouts (DB-60 to DB-15)

60 Pin	Signal	Description	Direction	15 Pin	Signal
J1-48 J1-47	GND MODE_2	Shorting group	–	–	–
J1-51 J1-52	GND MODE_DCE	Shorting group	–	–	–
J1-46	Shield_GND	Single	–	J2-1	Shield GND
J1-11 J1-12	TxD/RxD+ TxD/RxD–	Twisted pair no. 3	—> —>	J2-2 J2-9	Transmit+ Transmit–
J1-9 J1-10	RTS/CTS+ RTS/CTS–	Twisted pair no. 2	—> —>	J2-3 J2-10	Control+ Control–
J1-28 J1-27	RxD/TxD+ RxD/TxD–	Twisted pair no. 6	<— <—	J2-4 J2-11	Receive+ Receive–
J1-1 J1-2	CTS/RTS+ CTS/RTS–	Twisted pair no. 1	<— <—	J2-5 J2-12	Indication+ Indication–

60 Pin	Signal	Description	Direction	15 Pin	Signal
J1-26	RxC/TxCE+	Twisted pair no. 5	<—	J2-6	Timing+
J1-25	RxC/TxCE–		<—	J2-13	Timing–
J1-15	Control_GND	Twisted pair no. 4	–	J2-8	Control GND
Shield	–		–	Shield	–

Table C-20 X.21 DCE Cable Pinouts (DB-60 to DB-15)

60 Pin	Signal	Description	Direction	15 Pin	Signal
J1-48	GND	Shorting group	–	–	–
J1-47	MODE_2				
J1-46	Shield_GND	Single	–	J2-1	Shield GND
J1-28	RxD/TxD+	Twisted pair no. 6	<—	J2-2	Transmit+
J1-27	RxD/TxD–		<—	J2-9	Transmit–
J1-1	CTS/RTS+	Twisted pair no. 1	<—	J2-3	Control+
J1-2	CTS/RTS–		<—	J2-10	Control–
J1-11	TxD/RxD+	Twisted pair no. 3	—>	J2-4	Receive+
J1-12	TxD/RxD–		—>	J2-11	Receive–
J1-9	RTS/CTS+	Twisted pair no. 2	—>	J2-5	Indication+
J1-10	RTS/CTS–		—>	J2-12	Indication–
J1-24	TxC/RxC+	Twisted pair no. 4	—>	J2-6	Timing+
J1-23	TxC/RxC–		—>	J2-13	Timing–
J1-15	Control_GND	Twisted pair no. 5	–	J2-8	Control GND
Shield	–		–	Shield	–

ISDN BRI Port and Cable Pinouts

Table C-21 lists the port pinouts for the ISDN WAN module (without integrated NT1). Table C-22 lists the BRI port and cable pinouts for the ISDN WAN module with an integrated NT1 device.

Table C-21 BRI Port (RJ-45) Pinouts

RJ-45 8 Pin[1]	TE[2]	NT[3]	Polarity
3	Transmit	Receive	+
4	Receive	Transmit	+
5	Receive	Transmit	–
6	Transmit	Receive	–

1. Pins 1, 2, 7, and 8 are not used.
2. TE refers to terminal terminating layer 1 aspects of TE1, TA, and NT2 functional groups.
3. NT refers to network terminating layer 1 aspects of NT1 and NT2 functional groups.

Table C-22 BRI Cable (RJ-45-to-RJ-45) Pinouts

NT[1] RJ-45 (8 Pin)[2]	Wire	LT[3] RJ-45 (8 Pin)
4	Tip	4
5	Ring	5

1. NT refers to the network terminating layer 1 aspects of NT1 and NT2 functional groups.
2. Pins 1, 2, 3, 6, 7, and 8 are not used.
3. LT refers to the line termination point (i.e., at the wall jack).

APPENDIX B

Troubleshooting the Cisco 2524 and Cisco 2525 Routers

This appendix describes how to troubleshoot the Cisco 2524 and Cisco 2525 routers by referring to the LEDs on the rear panel of the chassis (see Figure 1-2 and Figure 1-3) and on the network processor modules (see Figure 1-4 through Figure 1-9).

The LEDs indicate the current operating condition of your router. You can observe the LEDs, note any fault condition that the router is encountering, and then contact your system administrator or a customer service representative, if necessary. Table B-1 describes the LEDs on the router chassis and WAN modules.

Table B-1 LEDs

Chassis/Module	LED	State	Description
Router chassis	Power	On steadily	Power is being supplied to the router.
		Off	Power is not reaching the router. Verify that the power supply is plugged into the wall receptacle, and that the cable from the power supply to the router is connected.
	Activity (Ethernet/ Token Ring[1])	Flickering	The Ethernet/Token Ring LAN connection is transmitting and receiving data normally.
		Off	The Ethernet/Token Ring LAN connection is not transmitting or receiving data. Check the Ethernet/Token Ring cable connection.

Chassis/Module	LED	State	Description
Router chassis	Ethernet link (Cisco 2524)[2]	On	The router senses the Ethernet 10BaseT link integrity signal, indicating normal operation.
		Off	The router is not sensing the Ethernet 10BaseT link integrity signal. Check the Ethernet 10BaseT cable connection.
	In-ring (Cisco 2525)	On	The router has been successfully inserted into the Token Ring, indicating normal operation.
		Off	The router has not been successfully inserted into the Token Ring. Check the Token Ring cable connection.
2-wire switched 56-kbps, 4-wire 56/64-kbps, and factional T1/T1 WAN DSU/CSU modules	RX	On	Data is being received at the DTE interface.
	TX	On	Data is transmitting from the DTE interface.
	CD (Carrier)	On	The DSU/CSU in the module is communicating with another DSU/CSU.
	Loopback	On	The DSU/CSU is in loopback mode.
	Alarm	On	An alarm condition is present.
Serial module	Activity (serial activity)	Flickering	The serial WAN connection is transmitting and receiving data normally.
		Off	The serial WAN connection is not transmitting or receiving data. Check the serial cable connection.
ISDN BRI module	Activity (ISDN BRI activity)	Flickering	The ISDN BRI WAN connection is transmitting and receiving data normally.
		Off	The ISDN BRI WAN connection is not transmitting or receiving data. Check the BRI cable connection.
ISDN BRI with integrated NT1 module	ACT (ISDN BRI activity)	Flickering	The ISDN BRI (with integrated NT1) WAN connection is transmitting and receiving data normally.
	NT1	On	The router detects the ISDN link integrity signal at the U interface[3] and the internal S/T interface[4], indicating that an ISDN connection has been established.

Chassis/Module	LED	State	Description
ISDN BRI with integrated NT1 module		Blinking once per second	The ISDN connection at the U interface is up, and the internal S/T interface is coming up. If this state persists, the ISDN port is either not configured or it is configured incorrectly.
		Blinking eight times per second	The ISDN connection at the U interface is coming up.
		Off	The router is not detecting the ISDN link integrity signal. An ISDN connection has not been established. Check the BRI cable connection.

1. The Token Ring activity LED is labelled ACT.
2. The Ethernet link LED is for the Ethernet 10BaseT port only; it does not work with the Ethernet AUI port.
3. The U interface is from the wall jack (telco interface) to the NT1 device.
4. The S/T interface is from the ISDN port on the module to the microprocessor.

Running Diagnostic Tests

If you have the fractional T1/T1 module, you can use external test equipment with the monitor jack labeled OUT to monitor signals coming into the RJ-48C port, without interrupting normal data transmission. You can use the monitor jack labeled IN to inject data, which would interrupt normal data transmission.

Getting Help

For information on technical support, onsite service, and exchange and repair services, refer to the *Cisco Information Packet* publication that shipped with your router.

APPENDIX A

Maintaining the Cisco 2524 and Cisco 2525 Routers

This appendix contains information about maintenance procedures you might need to perform on the router as your internetworking needs change.

This appendix contains the following sections:

- Installing WAN Modules
- Opening the Chassis
- Upgrading the Boot Flash Memory
- Upgrading the DRAM SIMM
- Replacing System-Code SIMMs
- Closing the Chassis
- Recovering Lost Passwords
- Virtual Configuration Register Settings
- Copying a Cisco IOS Image to Flash Memory

Caution Before opening the chassis, ensure that you have discharged all static electricity from your body and be sure the power is OFF. Before performing any procedures described in this appendix, review the sections “Safety Recommendations,” “Maintaining Safety with Electricity,” “Preventing Electrostatic Discharge Damage,” and “General Site Requirements” in the chapter “Preparing to Install the Cisco 2524 and Cisco 2525 Routers.”

Warning Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

Installing WAN Modules

You can install WAN modules in the router without removing the chassis cover. Each router chassis can accommodate up to three WAN modules—two synchronous serial and one ISDN. The choice of synchronous serial WAN modules is as follows:

- 2-wire switched 56-kbps DSU/CSU
- 4-wire 56/64-kbps DSU/CSU
- Fractional T1/T1 DSU/CSU
- Five-in-one synchronous serial

The choice of ISDN WAN modules is as follows:

- ISDN BRI
- ISDN with integrated NT1 device

The ISDN WAN modules are designed so that you cannot insert them into the synchronous serial WAN slots. A blank slot cover is installed over unused slots.

Take the following steps to install a WAN module:

Step 1 Turn OFF power to the router.

Caution Unlike some other Cisco routers, the WAN modules are not hot-swappable (that is, you cannot remove or install them when power to the router is ON). Be sure to turn OFF power to the router before installing or removing WAN modules. *Failure to do so may damage or halt the router.*

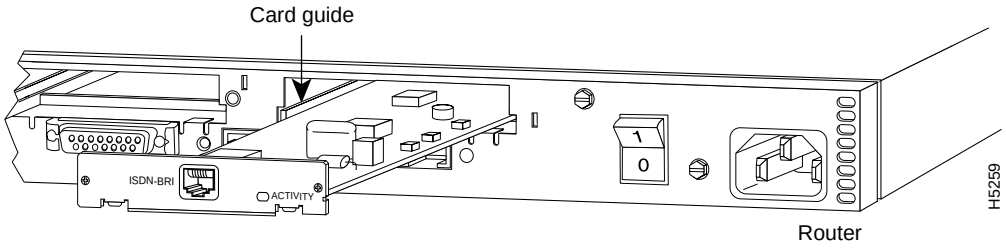
Step 2 Remove the WAN module from the ESD-protective shipping material.

Step 3 Slide the WAN module into the appropriate slot along the card guides until it is completely seated in the connector inside the router (see Figure A-1).

Step 4 Tighten the two captive screws on the module to secure it to the chassis.

Caution Although there are three slots available for the WAN modules, the slot on the far right (labeled BRI 0) is reserved for an ISDN WAN module only. Install all other modules in the slots labeled SERIAL 0 and SERIAL 1. The ISDN WAN modules are designed so that you cannot insert them into the synchronous serial slots.

Figure A-1 Installing a WAN Module



Step 5 If your router is configured with less than three WAN modules, make sure a blank slot cover is installed over each open slot to ensure proper airflow inside the chassis.

Opening the Chassis

This section describes the procedure for opening the chassis by removing the chassis cover.

Warning Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is OFF and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected. (To see translated versions of this warning, refer to the appendix “Translated Safety Warnings.”)

Tools Required

You will need the following tools to open the chassis:

- Medium-size flat-blade screwdriver (1/4 inch [0.625 cm])
- Size M 3.5 (metric) hex-head nut driver (optional)

Removing the Chassis Cover

You must open the router chassis to gain access to its interior components: the system card, system-code single in-line memory modules (SIMMs), and DRAM SIMMs. When opening the chassis, refer to Parts A and B in Figure A-2.

Warning Before opening the chassis, disconnect the telephone-network cables to avoid contact with telephone-network voltages. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings.")

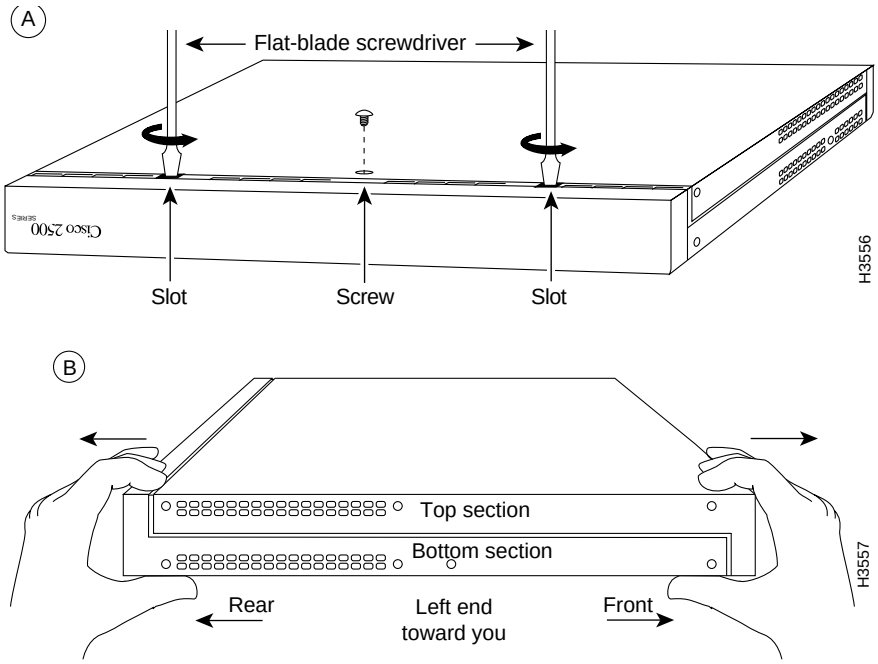
Take the following steps to remove the chassis cover:

Step 1 Turn OFF the power, but to channel electrostatic discharge (ESD) voltages to ground, do not unplug the power cable.

Step 2 Remove all interface cables from the rear panel of the router.

Step 3 Turn the unit upside down so that the top of the chassis is resting on a flat surface, and the front of the chassis is toward you. (See Figure A-2, Part A.)

Figure A-2 Chassis Cover Removal



Step 4 Remove the single screw located on the bottom of the chassis (on the side closest to you). Note that the chassis is comprised of two sections: top and bottom.

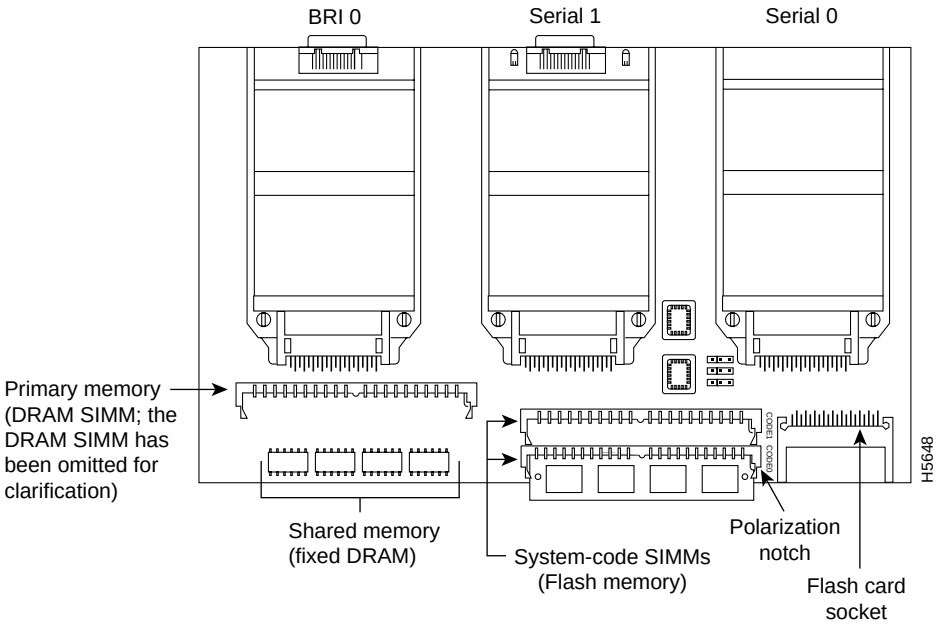
Step 5 If required, insert a medium-size flat-blade screwdriver into the slots shown in Figure A-2, Part A, and gently rotate the blade so that the top and bottom sections separate slightly.

Step 6 Holding the chassis with both hands, position it as shown in Figure A-2, Part B.

Step 7 Pull the top section away from the bottom section. (See Figure A-2, Part B.) The fit is very snug, so it may be necessary to pry the chassis sections apart at one end and then the other until they separate.

Step 8 When the top cover is off, set it aside. Figure A-3 shows the layout of the system card, which is attached to the bottom section of the chassis.

Figure A-3 System Card Layout—Cisco 2524



Upgrading the Boot Flash Memory

Take the following steps to upgrade the boot Flash memory:

Step 1 Turn OFF power, but to channel ESD voltages to ground, do not unplug the power cord.

Step 2 Attach an ESD-preventive wrist strap.

Step 3 Open the cover following the instructions in the section “Opening the Chassis” earlier in this appendix.

Step 4 Insert the Flash memory card into the Personal Computer Memory Card International Association (PCMCIA) slot.

Step 5 Turn ON power to the router. The system copies the boot image on the Flash memory card to the boot Flash memory on the system card:

```
Cisco Systems
Diagnostic Monitor

Testing boot state
Exiting boot state
Testing Main Memory from 0h to C000h. data equals address
Testing Main Memory from 0h to C000h. checkerboard
Testing Main Memory from 0h to C000h. inverse checkerboard
Clearing bss
Enabling interrupts
Exiting init
Boot flash size = 0x200000

etext = 0x1006860
addr = 0x1006861
beginning of header file addr = 0x1006874
got the flash file header number 1
Program flash location 0x81ed000
Boot flash frier is successful.
Please turn off the system and remove the Flash Credit Card.
```

Step 6 Remove the Flash memory card and turn ON power to the router.

Upgrading the DRAM SIMM

This section describes how to upgrade the DRAM SIMM on the system card. You might need to upgrade the DRAM SIMM for the following reasons:

- You upgrade the Cisco IOS feature set or release.
- Your router maintains large routing tables or other memory-intensive features, such as spoofing or protocol translations.

There are two types of DRAM memory in the Cisco 2524 and Cisco 2525 routers: fixed DRAM soldered on the system card and a removable DRAM SIMM (see Figure A-3). The DRAM SIMMs are available in 4, 8, or 16 MB. Depending on the Cisco IOS feature set originally ordered with your router, it may or may not include fixed DRAM. If the

Cisco IOS feature set requires a DRAM configuration other than 4, 8, or 16 MB, your router will have a combination of fixed DRAM and a DRAM SIMM. For example, if the Cisco IOS feature set originally ordered with your router requires 6-MB DRAM, your router will include 2-MB fixed DRAM and a 4-MB DRAM SIMM for a total of 6-MB DRAM (because a 6-MB DRAM SIMM is not available).

The system allocates the total memory installed on the fixed DRAM or the DRAM SIMM as primary and shared memory. Primary memory is used to store the operating configuration, routing tables, caches, queues, and packets. Shared memory is used to store incoming and outgoing packets.

Table A-1 describes the relationship between the physical configuration of DRAM (that is, fixed DRAM and which size DRAM SIMM are needed to obtain from 2- to 18-MB of total DRAM) and how the system allocates the DRAM as shared and primary DRAM.

Table A-1 DRAM Physical Configuration and System Allocation

	Physical Configuration		System Allocation	
Total DRAM (MB)	**Fixed DRAM (MB)**	**DRAM SIMM (MB)**	**Shared DRAM (MB)**	**Primary DRAM (MB)**
2	2	–	1	1
4	–	4	2	2
6	2	4	2	4
8	–	8	2	6
10	2	8	2	8
16	–	16	2	14
18	2	16	2	16

To see how much memory is currently installed in the router, enter the **show version** command. Near the middle of the resulting output, a message similar to the following displays:

```
Cisco XXXX(68030) processor (revision X) with 4092K/2048K bytes of memory.
```

This line shows how much memory is installed (in this example, 4092K/2048K). The first number represents primary memory and the second number represents shared memory.

Tools and Equipment Required

You will need the following tools to remove and replace the DRAM SIMM on the router:

- Medium-size flat-blade screwdriver (1/4 inch [0.625 cm])
- ESD-preventive wrist strap
- The DRAM SIMM required for your planned upgrade

DRAM SIMM Installation

Take the following steps to install the DRAM SIMMs:

Step 1 Turn OFF power to the router, but to channel ESD voltages to ground, do not unplug the power cord.

Step 2 Attach an ESD-preventive wrist strap.

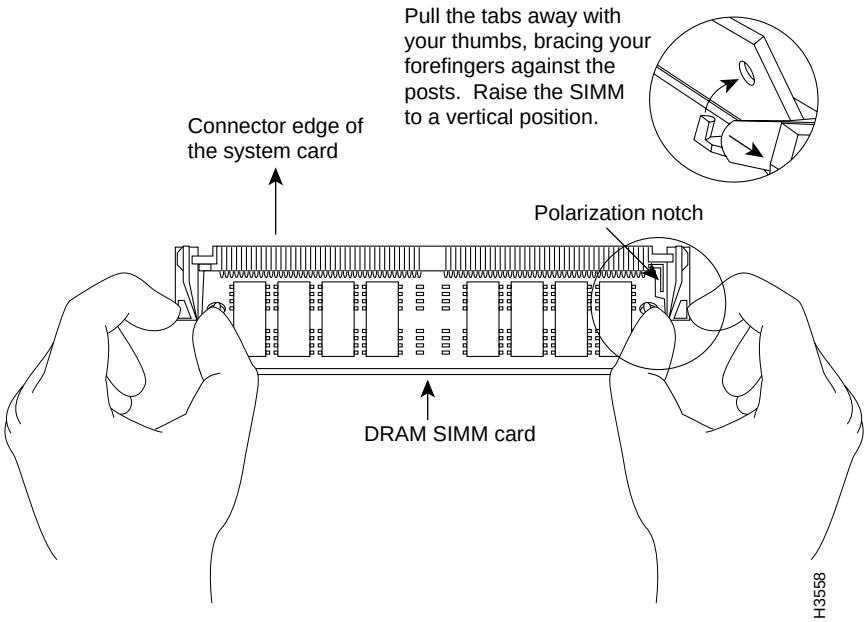
Step 3 Open the cover following the instructions in the section “Opening the Chassis” earlier in this appendix.

Step 4 Orient the chassis as shown in Figure A-3, with the primary-memory DRAM SIMM socket toward you.

Step 5 Remove the existing DRAM SIMM by pulling outward on the connectors to unlatch them, as shown in Figure A-4. Be careful not to break the holders on the SIMM connector.

Caution To prevent damage, do not press on the center of the SIMMs. Handle each SIMM carefully.

Figure A-4 Removing and Replacing the DRAM SIMM


Pull the tabs away with your thumbs, bracing your forefingers against the posts. Raise the SIMM to a vertical position.
Connector edge of the system card
Polarization notch
DRAM SIMM card
H3558

Step 6 Using the system card orientation shown in Figure A-4, position the new SIMM so that the polarization notch is located at the right end of the SIMM socket.

Step 7 Insert the new DRAM SIMM by sliding the end with the metal fingers into the SIMM connector socket at approximately a 45-degree angle to the system card. Gently rock the SIMM back into place until the latch on either side snaps into place. Do not use excessive force because the connector may break.

Step 8 Replace the router cover. Follow the instructions in the section “Closing the Chassis” later in this appendix.

Step 9 Connect the router to a console terminal.

Step 10 Turn ON power to the router. If error messages relating to memory are displayed, remove the DRAM SIMM and reinstall it, taking care to firmly seat the SIMM in its socket.

Replacing System-Code SIMMs

The system code (software) is stored in Flash memory SIMMs. The 80-pin Flash memory SIMMs must be purchased from Cisco Systems. Contact a customer service representative for more information.

Note The system code for both the Cisco 2524 and Cisco 2525 can be contained on either one or two 80-pin Flash memory SIMMs. If only one 80-pin SIMM socket is populated, it must be the SIMM socket indicated in Figure A-3 (labeled CODE0).

Tools and Equipment Required

You will need the following tools to remove and replace the system-code SIMMs on the router:

- Medium-size flat-blade screwdriver (1/4 inch [0.625 cm])
- ESD-preventive wrist strap
- The appropriate system-code SIMM(s) for your router

System-Code SIMM Replacement

Take the following steps to upgrade the system-code Flash memory SIMMs:

Step 1 Turn OFF the power, but to channel ESD voltages to ground, do not unplug the power cord.

Step 2 Attach an ESD-preventive wrist strap.

Step 3 Open the chassis cover following the procedure in the section “Opening the Chassis” earlier in this appendix.

Step 4 Orient the chassis as shown in Figure A-3, with the system-code SIMMs toward you.

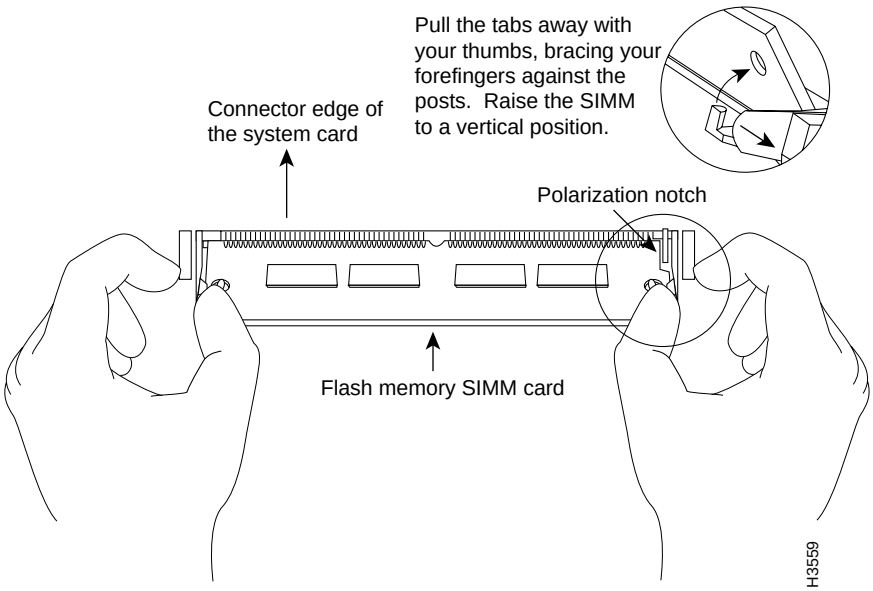
Step 5 Locate the system-code SIMMs on the system card. The SIMM sockets are labeled CODE0 and CODE1. (See Figure A-3.)

Step 6 Remove the existing system-code SIMM by pulling outward on the connector holders to unlatch them. The connector holds the SIMM tightly, so be careful not to break the holders on the SIMM connector. (See Figure A-5.)

Caution To prevent damage, do not press on the center of the SIMMs. Handle each SIMM carefully.

Step 7 Repeat these steps for all the system-code SIMMs to be replaced.

Figure A-5 Removing and Replacing the System-Code SIMM


Pull the tabs away with your thumbs, bracing your forefingers against the posts. Raise the SIMM to a vertical position.
Connector edge of the system card
Polarization notch
Flash memory SIMM card
H3559

Step 8 Using the system card orientation shown in Figure A-5, position the new SIMM so that the polarization notch is located at the right end of the SIMM socket.

Caution To prevent damage, note that some Flash memory SIMMs have the components mounted on the rear side; therefore, when inserting the SIMM, always use the polarization notch as a reference and *not* the position of the components on the SIMM.

Step 9 Insert the new SIMM by sliding the end with the metal fingers into the appropriate SIMM connector socket (labeled CODE0 or CODE1 in Figure A-3) at approximately a 45-degree angle to the system card. Gently rock the SIMM back into place until the latch on either side snaps into place. Do not use excessive force because the connector may break.

Step 10 Replace the router cover following the procedure in the next section, "Closing the Chassis."

Step 11 Connect the router to a console terminal.

Step 12 Turn ON the power to the chassis. If any error messages relating to memory display, remove the system-code SIMM and reinstall it, taking care to firmly seat the SIMM in the socket.

Closing the Chassis

This section describes the procedure for closing the chassis.

Tools Required

You will need the following tools to replace the cover:

- Medium-size flat-blade screwdriver (1/4 inch [0.625 cm])
- Size M 3.5 hex-head nut driver (optional)

Replacing the Cover

After you perform the maintenance for your system, perform the following steps to replace the cover:

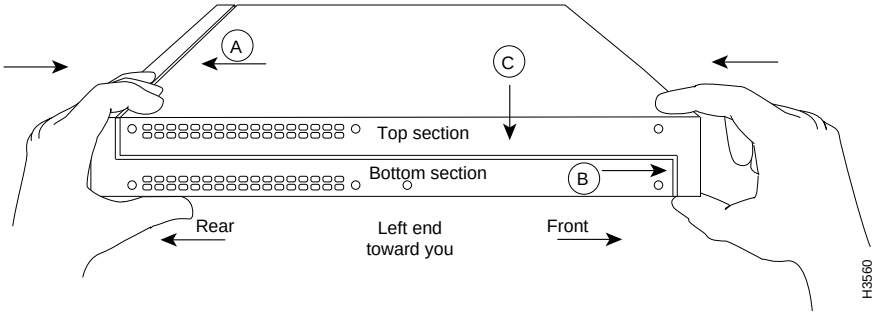
Step 1 Position the two chassis sections, as shown in Figure A-6.

Step 2 Referring to Figure A-6, press the two chassis sections together and ensure the following:

- The top section fits *into* the rear of the bottom section. (See A in Figure A-6.)
- The bottom section fits *into* the front of the top section. (See B in Figure A-6.)
- Each side of the top and bottom sections fits together. (See C in Figure A-6.)

Caution To fit the two sections together, it may be necessary to work them together at one end and then the other, working back and forth; however, use care to prevent bending the chassis edges.

Figure A-6 Replacing the Chassis Cover



Step 3 When the two sections fit together snugly, turn the chassis so that the bottom is facing up, with the front panel toward you.

Step 4 Replace the cover screw. (See Figure A-2.) Tighten the screw to no more than 8 or 9 inch/pounds of torque.

Step 5 Reinstall the chassis on the wall, rack, desktop, or table.

Step 6 Replace all cables.

Recovering Lost Passwords

This section explains how to recover the following types of passwords:

- An enable secret password (a very secure, encrypted password). The enable secret password is available on routers running Cisco IOS Release 10.3(2) or later.
- An enable password (a less secure, nonencrypted password). The enable password is used when the enable secret password does not exist.
- A console password. The console password is used to prevent unauthorized users from attempting to change the router configuration. When a console password is set, you must provide a password to log in to the console and access user EXEC mode.

The key to recovering a lost enable password is to set the configuration register so that the contents of NVRAM are ignored (0x142), which allows you to see your password. The enable secret password is encrypted and cannot be recovered; it must be replaced. The enable and console passwords might be encrypted or clear text.

Take the following steps to recover a lost password:

Step 1 Plan for some system downtime. The password recovery procedure requires a system reload.

Step 2 Connect a terminal to the console port on the rear panel of the router. Make sure the terminal is configured to operate at 9600 baud, 8 data bits, no parity, and 2 stop bits.

Step 3 Enter the **show version** command to display the existing configuration register value. The configuration register value is on the last line of the display. Note whether the configuration register is set to enable or disable Break.

The factory-default configuration register value is 0x2102. Notice that the third digit from the left in 0x2102 is 1, which disables Break. If the third digit is *not* 1, Break is enabled.

Step 4 If the configuration register is set to disable Break, power cycle the router. (Turn the router OFF, wait five seconds, and then turn the router ON again.) If the configuration register is set to enable Break, press the Break key or send a Break signal to the router and then proceed to Step 6.

Note If your keyboard does not have a Break key, refer to your terminal or terminal emulation software documentation for information about how to send a Break signal to the router.

Step 5 Within 60 seconds of turning ON the router, press the Break key or send a Break signal. The ROM monitor prompt (>) appears.

Step 6 Enter the **o/r** command to reset the configuration register to boot from the boot ROMs and ignore NVRAM:

```
> o/r 0x142
```

Step 7 Enter the **initialize** command to initialize the router:

```
> initialize
```

The router power cycles and the configuration register is set to 0x142. The router boots the system image in Flash memory and the System Configuration Dialog appears:

```
--- System Configuration Dialog ---
```

Step 8 Enter **no** in response to the System Configuration Dialog prompts until the following message appears:

```
Press RETURN to get started!
```

Step 9 Press **Return**.

Step 10 Enter privileged EXEC mode and then enter the **show startup-config** command to display the passwords in the configuration file:

```
Router> enable
Router# show startup-config
```

Step 11 Scan the configuration file displayed for the passwords (the enable and enable secret passwords are usually near the beginning of the file and the console password is near the end of the file). An example display follows:

```
enable secret 5 $1$ORPP$s9syZt4uKn3SnpuLDrhuei
enable password sand
.
.
line con 0
password seashells
```

Proceed to Step 12 to replace an enable secret, console, or enable password. If there is no enable secret password, note the enable and console passwords, if they are not encrypted, and proceed to Step 15.

Caution *Do not* take the next three steps unless you have determined that you must change or replace the enable, enable secret, or console passwords. Failure to follow the steps as shown might cause you to erase your router configuration.

Step 12 Enter the **configure memory** command to modify or replace passwords in NVRAM:

```
Router# configure memory
```

Step 13 Enter the **configure terminal** command to enter configuration mode:

```
Router# configure terminal
```

Step 14 Change only the passwords that are necessary for your configuration. The following example shows how to change all three types of passwords. The first two lines show how to change the enable secret and enable passwords. The last two lines show how to change the console password.

```
Router(config)# enable secret pail
Router(config)# enable password shovel
Router(config)# line con 0
Router(config-line)# password con1
```

For maximum security, be sure the enable secret and enable passwords are different.

You can remove individual passwords by using the **no** form of these commands. For example, enter the **no enable secret** command to remove the enable secret password.

Step 15 Configure all interfaces to be administratively up. In the following example, the Ethernet 0 port is configured to be administratively up:

```
Router(config-line)# interface ethernet 0
Router(config-if)# no shutdown
```

Enter the equivalent commands for all interfaces that were originally configured.

Step 16 Set the configuration register to the original value you noted in Step 3 or the factory-default value (0x2102). The following example shows how to set the configuration register to the factory-default value:

```
Router(config-if)# config-register 0x2102
Router(config)#
```

Step 17 Press **Ctrl-Z** to exit configuration mode.

Caution *Do not* take the next three steps unless you have changed or replaced a password or you might erase your router configuration. If there is no enable secret password (or if you skipped Step 12 through Step 14), proceed to Step 21 and log in.

Step 18 Enter the **copy running-config startup-config** command to save the new configuration to NVRAM. This command copies the changes you just made to the running configuration to the startup configuration. The following message appears:

```
Router# copy running-config startup-config
Building configuration...
[OK]
Router#
```

Step 19 Reboot the router:

```
Router# reload
Proceed with reload? [confirm]
```

Step 20 Press **Return** to confirm. When the router reboots it will use the new configuration register value you set in Step 16.

Step 21 Log in to the router with the new or recovered passwords.

Virtual Configuration Register Settings

The router has a 16-bit virtual configuration register, which is written into NVRAM. You might want to change the virtual configuration register settings for the following reasons:

- Set and display the configuration register value
- Force the system into the ROM monitor or boot ROM
- Select a boot source and default boot filename
- Enable or disable the Break function
- Control broadcast addresses
- Set the console terminal baud rate
- Recover a lost password (ignore the configuration file in NVRAM)
- Enable Trivial File Transfer Protocol (TFTP) server boot

Table A-2 lists the meaning of each of the virtual configuration memory bits, and defines the boot field names.

Caution To avoid confusion and possibly halting the router, remember that valid configuration register settings might be combinations of settings and not just the individual settings listed in Table A-2. For example, the factory default value of 0x2102 is a combination of settings.

Table A-2 Virtual Configuration Register Bit Meanings

Bit No.[1]	Hexadecimal	Meaning
00–03	0x0000–0x000F	Boot field
06	0x0040	Causes system software to ignore the contents of NVRAM (startup-config)
07	0x0080	OEM bit is enabled
08	0x0100	Break is disabled
10	0x0400	IP broadcast with all zeros
11–12	0x0800–0x1000	Console line speed
13	0x2000	Load the boot ROM software if a Flash boot fails five times
14	0x4000	IP broadcasts do not have network numbers
15	0x8000	Enable diagnostic messages and ignore the contents of NVRAM

1. The factory default value for the configuration register is 0x2102. This value is a combination of the following: bit 13 = 0x2000, bit 8 = 0x0100, and bits 00 through 03 = 0x0002.

Changing Configuration Register Settings

Take the following steps to change the configuration register while running the Cisco IOS software:

Step 1 Enter the **enable** command and your password to enter privileged mode:

```
Router> enable
password:
router#
```

Step 2 Enter the **configure terminal** command at the privileged-level system prompt (Router#)**:**

```
Router# configure terminal
```

Step 3 To set the contents of the configuration register, enter the configuration command **config-register** *value*, where *value* is a hexadecimal number preceded by 0x (see Table A-2 and Table A-3):

```
config-register 0xvalue
```

(The virtual configuration register is stored in NVRAM.)

Table A-3 Explanation of Boot Field (Configuration Register Bits 00 to 03)

Boot Field	Boot Process
0x0	Stops the boot process in the ROM monitor.
0x1	Stops the boot process in the boot ROM monitor.
0x3–0xF	Specifies a default filename for booting over the network from a TFTP server. Enables boot system commands that override the default filename for booting over the network from a TFTP server.
0x2	Full boot process, which loads the Cisco IOS image in Flash memory.

Step 4 Press **Ctrl-Z** to exit configuration mode. The new settings will be saved to memory; however, the new settings do not take effect until the system software is reloaded by rebooting the router.

Step 5 To display the configuration register value currently in effect and the value that will be used at the next reload, enter the **show version** EXEC command. The value displays on the last line of the screen display:

```
Configuration register is 0x142 (will be 0x102 at next reload)
```

Step 6 Reboot the router. The new value takes effect. Configuration register changes take effect only when the router restarts, which occurs when you switch the power OFF and ON or when you enter the **reload** command.

Virtual Configuration Register Bit Meanings

The lowest four bits of the virtual configuration register (bits 3, 2, 1, and 0) form the boot field. (See Table A-3.) The boot field specifies a number in binary form. If you set the boot field value to 0, you must boot the operating system manually by entering the **b** command at the bootstrap prompt, as follows:

```
> b [tftp] flash filename
```

The **b** command options are as follows:

- **b**—Boots the default system software from ROM
- **b flash**—Boots the first file in Flash memory
- **b** *filename [host]*—Boots from the network using a TFTP server
- **b flash** *[filename]*—Boots the file *filename* from Flash memory

For more information about the command **b [tftp] flash** *filename*, refer to the *Router Products Configuration Guide* publication for Cisco IOS Release 11.0 and earlier releases. Refer to the *Configuration Fundamentals Configuration Guide* publication for Cisco IOS Release 11.1 and later releases.

If you set the boot field value to a value of 0x2 through 0xF, and a valid system boot command is stored in the configuration file, the router boots the system software as directed by that value. If you set the boot field to any other bit pattern, the router uses the resulting number to form a default boot filename for booting from the network using a TFTP server. (See Table A-4.)

Table A-4 Default Boot Filenames

Action or Filename	Bit 3	Bit 2	Bit 1	Bit 0
bootstrap mode	0	0	0	0
ROM software	0	0	0	1
cisco2-igs	0	0	1	0
cisco3-igs	0	0	1	1
cisco4-igs	0	1	0	0
cisco5-igs	0	1	0	1

Action or Filename	Bit 3	Bit 2	Bit 1	Bit 0
cisco6-igs	0	1	1	0
cisco7-igs	0	1	1	1
cisco10-igs	1	0	0	0
cisco11-igs	1	0	0	1
cisco12-igs	1	0	1	0
cisco13-igs	1	0	1	1
cisco14-igs	1	1	0	0
cisco15-igs	1	1	0	1
cisco16-igs	1	1	1	0
cisco17-igs	1	1	1	1

In the following example, the virtual configuration register is set to boot the router from Flash memory and to ignore Break at the next reboot of the router:

```
router> enable
password: enablepassword
router# conf term
Enter configuration commands, one per line.
Edit with DELETE, CTRL/W, and CTRL/U; end with CTRL/Z
config-register 0x102
boot system flash [filename]
^Z
router#
```

The router creates a default boot filename as part of the automatic configuration processes. The boot filename consists of *cisco*, plug the octal equivalent of the boot field number, a hyphen, and the processor type.

Note A **boot system** configuration command in the router configuration in NVRAM overrides the default boot filename.

Bit 8 controls the console Break key. Setting bit 8 (the factory default) causes the processor to ignore the console Break key. Clearing bit 8 causes the processor to interpret the Break key as a command to force the system into the bootstrap monitor, thereby halting normal operation. A break can be sent in the first 60 seconds while the system reboots, regardless of the configuration settings.

Bit 10 controls the host portion of the IP broadcast address. Setting bit 10 causes the processor to use all zeros; clearing bit 10 (the factory default) causes the processor to use all ones. Bit 10 interacts with bit 14, which controls the network and subnet portions of the broadcast address. (See Table A-5.)

Table A-5 Configuration Register Settings for Broadcast Address Destination

Bit 14	Bit 10	Address (<net> <host>)
Off	Off	<ones> <ones>
Off	On	<zeros> <zeros>
On	On	<net> <zeros>
On	Off	<net> <ones>

Bits 11 and 12 in the configuration register determine the baud rate of the console terminal. Table A-6 shows the bit settings for the four available baud rates. (The factory-set default baud rate is 9600.)

Table A-6 System Console Terminal Baud Rate Settings

Baud	Bit 12	Bit 11
9600	0	0
4800	0	1
1200	1	0
2400	1	1

Bit 13 determines the server response to a bootload failure. Setting bit 13 causes the server to load operating software from ROM after five unsuccessful attempts to load a boot file from the network. Clearing bit 13 causes the server to continue attempting to load a boot file from the network indefinitely. By factory default, bit 13 is set to 1.

Enabling Booting from Flash Memory

To disable Break and enable the **boot system flash** command, enter the **config-register** command with the value shown in the following example:

```
router> enable
Password: enablepassword
router# config term
Enter configuration commands, one per line.
Edit with DELETE, CTRL/W, and CTRL/U; end with CTRL/Z
config-reg 0x2102
^Z
router#
```

Copying a Cisco IOS Image to Flash Memory

You may need to copy a new Cisco IOS image to Flash memory whenever a new image or maintenance release becomes available. To copy a new image into Flash memory (write to Flash), you *must* first reboot from ROM and *then* copy the new image into Flash memory. You *cannot* copy a new image into Flash memory while the system is running from Flash memory. Use the **copy tftp flash** command for the copy procedure.

Take the following steps to copy a new image to Flash memory:

Step 1 Enter the **show flash** command to make sure there is enough space available before copying a file to Flash memory. Compare the size of the file you want to copy to the amount of available Flash memory displayed.

Step 2 Make a backup copy of the current image.

Step 3 Enter enable mode and then enter the **copy tftp flash** command to copy the new image into Flash memory:

```
Router> enable
Password: enablepassword
Router# copy tftp flash
```

The following messages display:

```
                          ****  NOTICE  ****
Flash load helper v1.0
This process will accept the copy options and then terminate
the current system image to use the ROM based image for the copy.
Routing functionality will not be available during that time.
If you are logged in via telnet, this connection will terminate.
Users with console access can see the results of the copy operation.
                          ---- ******** ----
Proceed? [confirm]
```

Step 4 Press **Return** to confirm. If there is an image already in Flash memory, the router displays the name and size of the file. Then the router prompts you for the IP address or name of the remote host:

```
Address or name of remote host [hostname]?
```

The remote host can be a server or another router with a valid Flash system software image.

Step 5 Enter the IP address or name of the remote host. The router then prompts you for the name of the source file:

```
Source file name?
```

Step 6 Enter the name of the source file. The following prompt displays:

```
Destination file name [filename]?
```

Step 7 Press **Return** to accept the default filename or enter a different filename. Messages similar to the following display:

```
Accessing file 'master/igs-j-l.110-4.2' on hostname...
Loading master/igs-j-l.110-4.2 from 172.16.72.1 (via Ethernet0): !
[OK]

Erase flash device before writing? [confirm] yes
```

Step 8 Enter **yes** to erase the contents of Flash memory. The following message displays:

```
Flash contains files. Are you sure you want to erase? [confirm] yes
```

Step 9 Enter **yes** to confirm that you want to erase the contents of Flash memory. Messages similar to the following display:

```
%SYS-5-RELOAD: Reload requested

%FLH: master/igs-j-l.110-4.2 from 172.16.72.1 to flash ...

System flash directory:
File  Length   Name/status
  1   3459776 username/igs-i-l
[3459840 bytes used, 4928768 available, 8388608 total]Configuration
mapped ip address 172.16.72.1 to hostname
Accessing file 'master/igs-j-l.110-4.2' on hostname...
Loading master/igs-j-l.110-4.2 from 172.16.72.1 (via Ethernet0): !
[OK]

Erasing device... eeeeeeeeeeeeeeeeeeeeeeeeeeeeee ...erased
Loading master/igs-j-l.110-4.2 from 172.16.72.1 (via Ethernet0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

APPENDIX D

Translated Safety Warnings

This appendix repeats in multiple languages the warnings in this publication.

Warning Definition

Warning This warning symbol means *danger.* You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents.

Waarschuwing Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen.

Varoitus Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista.

Attention Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents.

Warnung Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt.

Avvertenza Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti.

Advarsel Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du vare oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker.

Aviso Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes.

¡Advertencia! Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes.

Varning! Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador.

Product Disposal Warning

Warning Ultimate disposal of this product should be handled according to all national laws and regulations.

Waarschuwing Dit produkt dient volgens alle landelijke wetten en voorschriften te worden afgedankt.

Varoitus Tämän tuotteen lopullisesta hävittämisestä tulee huolehtia kaikkia valtakunnallisia lakeja ja säännöksiä noudattaen.

Attention La mise au rebut définitive de ce produit doit être effectuée conformément à toutes les lois et réglementations en vigueur.

Warnung Dieses Produkt muß den geltenden Gesetzen und Vorschriften entsprechend entsorgt werden.

Avvertenza L'eliminazione finale di questo prodotto deve essere eseguita osservando le normative italiane vigenti in materia.

Advarsel Endelig disponering av dette produktet må skje i henhold til nasjonale lover og forskrifter.

Aviso A descartagem final deste produto deverá ser efectuada de acordo com os regulamentos e a legislação nacional.

¡Advertencia! El desecho final de este producto debe realizarse según todas las leyes y regulaciones nacionales.

Varning! Slutlig kassering av denna produkt bör skötas i enlighet med landets alla lagar och föreskrifter.

Jewelry Removal Warning

Warning Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.

Waarschuwing Alvorens aan apparatuur te werken die met elektrische leidingen is verbonden, sieraden (inclusief ringen, kettingen en horloges) verwijderen. Metalen voorwerpen worden warm wanneer ze met stroom en aarde zijn verbonden, en kunnen ernstige brandwonden veroorzaken of het metalen voorwerp aan de aansluitklemmen lassen.

Varoitus Ennen kuin työskentelet voimavirtajohtoihin kytkettyjen laitteiden parissa, ota pois kaikki korut (sormukset, kaulakorut ja kellot mukaan lukien). Metalliesineet kuumenevat, kun ne ovat yhteydessä sähkövirran ja maan kanssa, ja ne voivat aiheuttaa vakavia palovammoja tai hitsata metalliesineet kiinni liitäntänapoihin.

Attention Avant d'accéder à cet équipement connecté aux lignes électriques, ôter tout bijou (anneaux, colliers et montres compris). Lorsqu'ils sont branchés à l'alimentation et reliés à la terre, les objets métalliques chauffent, ce qui peut provoquer des blessures graves ou souder l'objet métallique aux bornes.

Warnung Vor der Arbeit an Geräten, die an das Netz angeschlossen sind, jeglichen Schmuck (einschließlich Ringe, Ketten und Uhren) abnehmen. Metallgegenstände erhitzen sich, wenn sie an das Netz und die Erde angeschlossen werden, und können schwere Verbrennungen verursachen oder an die Anschlußklemmen angeschweißt werden.

Avvertenza Prima di intervenire su apparecchiature collegate alle linee di alimentazione, togliersi qualsiasi monile (inclusi anelli, collane, braccialetti ed orologi). Gli oggetti metallici si riscaldano quando sono collegati tra punti di alimentazione e massa: possono causare ustioni gravi oppure il metallo può saldarsi ai terminali.

Advarsel Fjern alle smykker (inkludert ringer, halskjeder og klokker) før du skal arbeide på utstyr som er koblet til kraftledninger. Metallgjenstander som er koblet til kraftledninger og jord blir svært varme og kan forårsake alvorlige brannskader eller smelte fast til polene.

Aviso Antes de trabalhar em equipamento que esteja ligado a linhas de corrente, retire todas as jóias que estiver a usar (incluindo anéis, fios e relógios). Os objectos metálicos aquecerão em contacto com a corrente e em contacto com a ligação à terra, podendo causar queimaduras graves ou ficarem soldados aos terminais.

¡Advertencia! Antes de operar sobre equipos conectados a líneas de alimentación, quitarse las joyas (incluidos anillos, collares y relojes). Los objetos de metal se calientan cuando se conectan a la alimentación y a tierra, lo que puede ocasionar quemaduras graves o que los objetos metálicos queden soldados a los bornes.

Varning! Tag av alla smycken (inklusive ringar, halsband och armbandsur) innan du arbetar på utrustning som är kopplad till kraftledningar. Metallobjekt hettas upp när de kopplas ihop med ström och jord och kan förorsaka allvarliga brännskador; metallobjekt kan också sammansvetsas med kontakterna.

Ground Connection Warning

Warning When installing the unit, the ground connection must always be made first and disconnected last.

Waarschuwing Bij de installatie van het toestel moet de aardverbinding altijd het eerste worden gemaakt en het laatste worden losgemaakt.

Varoitus Laitetta asennettaessa on maahan yhdistäminen aina tehtävä ensiksi ja maadoituksen irti kytkeminen viimeiseksi.

Attention Lors de l’installation de l’appareil, la mise à la terre doit toujours être connectée en premier et déconnectée en dernier.

Warnung Der Erdanschluß muß bei der Installation der Einheit immer zuerst hergestellt und zuletzt abgetrennt werden.

Avvertenza In fase di installazione dell'unità, eseguire sempre per primo il collegamento a massa e disconnetterlo per ultimo.

Advarsel Når enheten installeres, må jordledningen alltid tilkobles først og frakobles sist.

Aviso Ao instalar a unidade, a ligação à terra deverá ser sempre a primeira a ser ligada, e a última a ser desligada.

¡Advertencia! Al instalar el equipo, conectar la tierra la primera y desconectarla la última.

Varning! Vid installation av enheten måste jordledningen alltid anslutas först och kopplas bort sist.

Installation Warning

Warning Read the installation instructions before you connect the system to its power source.

Waarschuwing Raadpleeg de installatie-aanwijzingen voordat u het systeem met de voeding verbindt.

Varoitus Lue asennusohjeet ennen järjestelmän yhdistämistä virtalähteeseen.

Attention Avant de brancher le système sur la source d'alimentation, consulter les directives d'installation.

Warnung Lesen Sie die Installationsanweisungen, bevor Sie das System an die Stromquelle anschließen.

Avvertenza Consultare le istruzioni di installazione prima di collegare il sistema all’alimentatore.

Advarsel Les installasjonsinstruksjonene før systemet kobles til strømkilden.

Aviso Leia as instruções de instalação antes de ligar o sistema à sua fonte de energia.

¡Advertencia! Ver las instrucciones de instalación antes de conectar el sistema a la red de alimentación.

Varning! Läs installationsanvisningarna innan du kopplar systemet till dess strömförsörjningsenhet.

TN Power Warning

Warning The device is designed to work with TN power systems.

Waarschuwing Het apparaat is ontworpen om te functioneren met TN energiesystemen.

Varoitus Koje on suunniteltu toimimaan TN-sähkövoimajärjestelmien yhteydessä.

Attention Ce dispositif a été conçu pour fonctionner avec des systèmes d'alimentation TN.

Warnung Das Gerät ist für die Verwendung mit TN-Stromsystemen ausgelegt.

Avvertenza Il dispositivo è stato progettato per l’uso con sistemi di alimentazione TN.

Advarsel Utstyret er utfomet til bruk med TN-strømsystemer.

Aviso O dispositivo foi criado para operar com sistemas de corrente TN.

¡Advertencia! El equipo está diseñado para trabajar con sistemas de alimentación tipo TN.

Varning! Enheten är konstruerad för användning tillsammans med elkraftssystem av TN-typ.

Circuit Breaker (15A) Warning

Warning This product relies on the building’s installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A U.S. (240 VAC, 10A international) is used on the phase conductors (all current-carrying conductors).

Waarschuwing Dit produkt is afhankelijk van de installatie van het gebouw voor kortsluit- (overstroom)beveiliging. Controleer of er een zekering of stroomverbreker van niet meer dan 120 Volt wisselstroom, 15 A voor de V.S. (240 Volt wisselstroom, 10 A internationaal) gebruikt wordt op de fasegeleiders (alle geleiders die stroom voeren).

Varoitus Tämä tuote on riippuvainen rakennukseen asennetusta oikosulkusuojauksesta (ylivirtasuojauksesta). Varmista, että vaihevirtajohtimissa (kaikissa virroitetuissa johtimissa) käytetään Yhdysvalloissa alle 120 voltin, 15 ampeerin ja monissa muissa maissa 240 voltin, 10 ampeerin sulaketta tai suojakytkintä.

Attention Pour ce qui est de la protection contre les courts-circuits (surtension), ce produit dépend de l'installation électrique du local. Vérifier qu'un fusible ou qu'un disjoncteur de 120 V alt., 15 A U.S. maximum (240 V alt., 10 A international) est utilisé sur les conducteurs de phase (conducteurs de charge).

Warnung Dieses Produkt ist darauf angewiesen, daß im Gebäude ein Kurzschluß- bzw. Überstromschutz installiert ist. Stellen Sie sicher, daß eine Sicherung oder ein Unterbrecher von nicht mehr als 240 V Wechselstrom, 10 A (bzw. in den USA 120 V Wechselstrom, 15 A) an den Phasenleitern (allen stromführenden Leitern) verwendet wird.

Avvertenza Questo prodotto dipende dall'installazione dell'edificio per quanto riguarda la protezione contro cortocircuiti (sovracorrente). Verificare che un fusibile o interruttore automatico, non superiore a 120 VCA, 15 A U.S. (240 VCA, 10 A internazionale) sia stato usato nei fili di fase (tutti i conduttori portatori di corrente).

Advarsel Dette produktet er avhengig av bygningens installasjoner av kortslutningsbeskyttelse (overstrøm). Kontroller at det brukes en sikring eller strømbryter som ikke er større enn 120 VAC, 15 A (USA) (240 VAC, 10 A internasjonalt) på faselederne (alle strømførende ledere).

Aviso Este produto depende das instalações existentes de protecção contra curto-circuito (sobrecarga). Assegure-se de que um fusível ou disjuntor não superior a 240 VAC, 10A é utilizado nos condutores de fase (todos os condutores de transporte de corrente).

¡Advertencia! Este equipo utiliza el sistema de protección contra cortocircuitos (o sobrecorrientes) del propio edificio. Asegurarse de que se utiliza un fusible o interruptor automático de no más de 240 voltios en corriente alterna (VAC), 10 amperios del estándar internacional (120 VAC, 15 amperios del estándar USA) en los hilos de fase (todos aquéllos portadores de corriente).

Varning! Denna produkt är beroende av i byggnaden installerat kortslutningsskydd (överströmsskydd). Kontrollera att säkring eller överspänningsskydd används på fasledarna (samtliga strömförande ledare) ¥ för internationellt bruk max. 240 V växelström, 10 A (i USA max. 120V växelström, 15 A).

SELV Circuit Warning

Warning The Ethernet 10BaseT, Token Ring, serial, console, and auxiliary ports contain safety extra-low voltage (SELV) circuits. BRI circuits are treated like telephone-network voltage (TNV) circuits. Avoid connecting SELV circuits to TNV circuits.

Waarschuwing De 10BaseT-, de Token Ring- en de hulppoorten, de seriële poorten en de poorten op het console voor Ethernet zijn voorzien van veiligheidscircuits met extra laag voltage (SELV). BRI-circuits worden als circuits met telefoonnetwerk voltage (TNV) behandeld.

Varoitus Ethernet 10BaseT-, Token Ring-, sarja-, konsoli- ja lisäporteissa on pienjännitteisiä SELV-suojapiirejä. BRI-piirejä käsitellään puhelinverkkojännitettä (TNV) käyttävien virtapiirien tavoin. Vältä liittämästä SELV-piirejä TNV-piireihin.

Attention Les ports Ethernet 10BaseT, Token Ring, série, console et auxiliaire contiennent des circuits de sécurité basse tension (Safety Extra-Low Voltage ou SELV). Les circuits BRI sont traités comme des circuits de tension de réseau téléphonique (telephone network voltage ou TNV). Eviter de connecter des circuits SELV à des circuits TNV.

Warnung Die Ethernet 10BaseT, Token Ring und Seriell-, Konsolen- und Hilfsanschlüsse enthalten SELV-Schaltungen (Sicherheitskleinspannungs-Schaltungen). BRI-Schaltungen werden wie TNV-Schaltungen (Telefonnetzspannungsschaltungen) behandelt. SELV-Schaltungen sind nicht an TNV-Schaltungen anzuschließen.

Avvertenza Le porte Ethernet, 10BaseT, Token Ring, seriali, di consolle ed ausiliarie contengono circuiti di sicurezza con tensione molto bassa (SELV). I circuiti BRI vengono trattati come circuiti a tensione di rete telefonica (TNV). Evitare di collegare circuiti SELV a circuiti TNV.

Advarsel Utgangene for Ethernet 10BaseT og Token Ring, samt serie-, konsoll- og ekstrautgangene inneholder lavspentkretser (SELV) for ekstra sikkerhet. BRI-kretsene håndteres som kretser for telenettspenning (TNV). Unngå å koble SELV-kretser til TNV-kretser.

Aviso As portas Ethernet, 10BaseT, Token Ring, console e auxiliares contêm circuitos de segurança de tensão extra-baixa (SELV). Os circuitos BRI (Interface de Ritmo Básico) são tratados como circuitos de tensão equivalente à da rede telefónica (TNV). Evite ligar circuitos SELV a circuitos TNV.

¡Atención! Los puertos Ethernet 10BaseT, Token Ring, serie, consola y auxiliar incluyen circuitos de muy baja señal (SELV). Los circuitos BRI se comportan como circuitos de voltaje de red telefónica (TNV). No deben conectarse circuitos SELV con circuitos TNV.

Varning! Portarna för Ethernet 10BaseT och Token Ring, serie- och konsollportarna samt de extra portarna är anslutna till säkerhetskretsar med extra låg spänning (SELV-kretsar). BRI-kretsarna jämställs med kretsar med telefonnätspänning (TNV). Undvik att koppla SELV-kretsar till TNV-kretsar.

BRI, Fractional T1/T1, and Switched 56 Cable Warning

Warning Network hazardous voltages are present in the BRI, fractional T1/T1, and switched 56 cables. If you detach the cable, detach the end away from the router first to avoid possible electric shock. Network hazardous voltages are also present in the area of the BRI (RJ-45), fractional T1/T1 (RJ-48C), and switched 56 (RJ-11 or RJ-48S) ports, regardless of whether power is off or on.

Waarschuwing In de BRI, fractionele T1/T1 en omgeschakelde 56 kabels zijn gevaarlijke voltages voor netwerken aanwezig. Als u de kabel loskoppelt, dient eerst het uiteinde dat zich het verst van de router vandaan bevindt, verwijderd te worden om mogelijke elektrische schok te vermijden. Gevaarlijke voltages voor netwerken zijn eveneens aanwezig in de buurt van de BRI (RJ-45), fractionele T1/T1 (RJ-48C) en de omgeschakelde 56 poorten (RJ-11 of RJ-48S), ongeacht of de stroom aangesloten is of niet.

Varoitus Vaarallisia verkkojännitteitvallitsee kaapelityypeissä BRI, fraktioitu T1/T1 ja Switched 56. Jos poistat kaapelin, irrota reitittimestä pois johtava pää ensiksi, jotta välttyisit mahdolliselta sähköiskulta. Vaarallisia verkkojännitteitä on myös kaapelityyppien BRI (RJ-45), fraktioitu T1/T1 (RJ-48C) ja Switched 56 (RJ-11 tai RJ-48) porttialueilla, riippumatta siitä, onko virta kytketty vai ei.

Attention Des tensions dangereuses de réseau sont présentes dans les câbles BRI, TI/TI fractionnel et 56 permuté. En cas de débranchement du câble, détacher d abord le routeur pour éviter toute électrocution. Des tensions dangereuses de réseau sont également présentes aux ports BRI (RJ-45), TI/TI fractionnel (RJ-48C) et 56 permuté (RJ-11 ou RJ-48S) que ces ports soient sous tension ou hors tension.

Warnung Gefährliche Netzspannungen bestehen im BRI-, TI/TI-Teil- und Switched 56-Kabel. Das Kabel am vom Router entfernten Ende zuerst abziehen, um Elektroschock zu verhüten. Gefährliche Spannungen bestehen auch im Bereich der Anschlüsse von BRI (RJ-45), T1/T1-Teilen (RJ-48C) und Switched 56 (RJ-11 oder RJ-48S), gleichgültig, ob die Stromversorgung ein- oder ausgeschaltet ist.

Avvertenza Nei cavi BRI, T1/T1 frazionario e 56 commutato sono presenti tensioni di rete pericolose. Se si deve scollegare un tale cavo, scollegarne innanzitutto il terminale collegato al router, per evitare folgorazioni. Tensioni di rete pericolose sono anche presenti nell'area delle porte BRI (RJ-45), T1/T1 frazionaria (RJ-48C) e 56 commutata (RJ-11 o RJ-48S), indipendentemente dall'essere l'alimentazione collegata o meno.

Advarsel Det er livsfarlig nettverksspenning i BRI-kabelen, T1-kabelen, T1-kabelen med delt båndbredde og Switched 56-kabelen. Hvis du løsner kabelen, må du først løsne den enden som er lengst borte fra fordelingsenheten for å unngå elektrisk støt. Det er også livsfarlig spenning i området rundt BRI-utgangen (RJ-45), utgangen for T1-kabelen og T1-kabelen med delt båndbredde (RJ-48C) og Switched 56-utgangen (RJ-11 eller RJ-48S), uavhengig av om strømmen er av eller på.

Aviso Existem tensões de rede perigosas nos cabos BRI (Interface de Ritmo Básico), nos cabos parciais T1/T1 e nos cabos Comutados 56. Se desligar o cabo, desligue primeiro a extremidade do distribuidor para evitar um possível choque eléctrico. Também existem tensões de rede perigosas na área das portas BRI (RJ-45), parcial T1/T1 (RJ-48C) e Comutada 56 (RJ-11 ou RJ-48S), independentemente do facto da corrente se encontrar ou não ligada.

¡Atención! Hay tensiones de red peligrosas en los siguientes cables: BRI, T1/T1 fraccionario y 56 conmutado. Si desconecta los cables, desconecte primero el extremo que va al router para evitar la posible sacudida eléctrica. Estas peligrosas tensiones de red se encuentran presentes también en el área de los puertos BRI (conector RJ-45), T1/T1 fraccionario (conector RJ-48C) y 56 conmutado (conector RJ-11 o RJ-48S), haya alimentación o no.

Varning! Nätspänningen på BRI-kablar, T1-kablar med delad bandbredd/T1-kablar och Switched 56-kablar utgör personfara. Om kabel kopplas bort ska den del av kabeln som inte är ansluten till distributören kopplas bort först, så att elektriska stötar undviks. Nätspänningen i området kring BRI-porten (RJ-45), porten för T1-kablar med delad bandbredd/T1-kablar (RJ-48C) och Switched 56-porten (RJ-11 eller RJ-48S) utgör också personfara, oavsett om strömförsörjningen är bruten eller ej.

UL- and CSA-Certified Equipment Warning

Warning This card is intended to be installed in UL- and CSA-certified equipment in the field by the user in the manufacturer's defined operator access area. Check the equipment manufacturer to verify/confirm if your equipment is suitable for user-installed application cards.

Waarschuwing Deze kaart dient door de gebruiker zelf in in het veld toegepaste en van het UL- en het CSA-keurmerk voorziene apparatuur geïnstalleerd te worden op de voor de operator toegankelijke plaats zoals deze door de fabrikant is aangegeven. Controleer de naam van de fabrikant van de apparatuur om na te gaan of uw apparatuur geschikt is voor door de gebruiker te installeren toepassingskaarten.

Varoitus Tämä kortti on tarkoitettu käyttäjän asennettavaksi laitteistoon, jonka Underwriters Laboratory (UL) tai Kanadan standardisointiyhdistys (CSA) on hyväksynyt, valmistajan rajatulla käyttöalueella. Ota yhteyttä laitteiston valmistajaan varmistaaksesi, soveltuuko laitteisto käyttäjän asentamiin sovelluskortteihin.

Attention La carte doit être installée par l'utilisateur sur un appareil homologué UL et CSA, sur place dans la zone d'accès de l'opérateur déterminée par le fabricant. Consulter le fabricant de l'appareil pour vérifier/confirmer que l'appareil utilisé supporte les cartes d'applications installées par l'utilisateur.

Warnung Diese Karte ist zur benutzerseitigen Installation in UL-, CSA- bzw. VDE-zugelassenen Geräten am Standort des Benutzers vorgesehen, und zwar in einem vom Hersteller ausgewiesenen Bereich für Bedienerzugriff. Beim Gerätehersteller nachfragen, ob das jeweilige Gerät wirklich für benutzerseitig installierbare Anwendungskarten geeignet ist.

Avvertenza Questa scheda deve essere installata sul campo dall'utente in apparecchi muniti di omologazione CSA ed UL, nell'area di accesso all'operatore specificata dal fabbricante. Rivolgersi al fabbricante dell'apparecchiatura per verificare/confermare che l'apparecchiatura stessa sia adeguata a schede da applicazione installate dall'utente.

Advarsel Dette kortet skal installeres av brukeren i UL- og CSA-godkjent utstyr i brukerområdet som er definert av produsenten. Forhør deg med produsenten for å bekrefte om utstyret ditt kan brukes med brukerinstallerte programkort.

Aviso Esta placa destina-se a ser instalada no campo pelo utilizador em equipamento certificado UL e CSA, na área de acesso de operador definida pelo fabricante. Contacte o fabricante para verificar/confirmar se o seu equipamento é adequado para placas de aplicação instalados pelo utilizador.

¡Atención! Esta tarjeta se ha diseñado para que sea instalada por el usuario en equipos homologados por UL y CSA, ubicados en campo y específicamente situados en áreas de acceso para el operador determinadas por el fabricante. Consulte con el fabricante del equipo para comprobar o confirmar que este último puede aceptar tarjetas de aplicación cuya instalación es realizada por el usuario.

Varning! Detta kort skall installeras av användaren i UL- och CSA-godkänd utrustning i användningsområdet som är definierat av producenten. Förhör dig med producenten för att bekräfta om din utrustning kan användas med användarinstallerade programkort.

ISDN Connection Warning

Warning The ISDN connection is regarded as a source of voltage that should be inaccessible to user contact. Do not attempt to tamper with or open any public telephone operator (PTO)-provided equipment or connection hardware. Any hardwired connection (other than by nonremovable, connect-one-time-only lug) must be made only by PTO staff or suitably trained engineers.

Waarschuwing De verbinding met ISDN (Integrated Services Digital Network = Digitaal netwerk met geïntegreerde faciliteiten) wordt beschouwd als een spanningsbron die ontoegankelijk dient te zijn voor gebruikers. Gebruikers dienen geen poging te doen om door de openbare telefoondienst (PTT) verstrekte apparatuur of aansluitingshardware te openen of ermee te knoeien. Alle vastbedrade verbindingen (behalve die verbindingen die gemaakt zijn door niet-verwijderbare, slechts eenmaal te verbinden aansluitpunten) dienen slechts door PTT-personeel of door daartoe opgeleide ingenieurs gemaakt te worden.

Varoitus ISDN-liitäntää pidetään jännitelähteenä, jonka kanssa käyttäjän ei tulisi päästä kosketuksiin. Käyttäjien ei tulisi yrittää peukaloida tai avata laitteita tai liittimiä, jotka kuuluvat yleiselle puhelinlaitokselle (PTO). Ainoastaan yleisen puhelinlaitoksen henkilökunnan tai ammattitaitoisten teknikoiden tulee tehdä kaapeliliitännät (lukuun ottamatta kiinteitä kiinnityskorvia, jotka yhdistetään ainoastaan yhden kerran).

Attention La connexion du réseau numérique intégré (Integrated Services Digital Network ou ISDN) constitue une source de tension qui ne doit pas être accessible à l'utilisateur. Les utilisateurs ne doivent jamais tenter de modifier ni même d'ouvrir un matériel fourni par une compagnie de téléphone public, ou le matériel de connexion. Toute connexion câblée (autre que celles établies par cosse non démontable àconnexion unique) ne doit être effectuée que par le personnel de la compagnie du téléphone ou par des techniciens proprement formés.

Warnung Die ISDN-Verbindung (Integrated Services Digital Network = diensteintegrierendes Digitalnetz) gilt als eine Spannungsquelle, die dem Anwender unzugänglich sein sollte. Anwender sollten nicht versuchen, sich an der von den Anbietern öffentlicher TK-Dienste gelieferten Ausstattung oder Verbindungs-Hardware zu schaffen zu machen oder sie zu öffnen. Alle festverdrahteten Verbindungen (mit Ausnahme der mit nicht entfernbaren, einmal anzuschließenden Kabelschuhen hergestellten) sind von Mitarbeitern des TK-Anbieters oder von entsprechend ausgebildeten Technikern herzustellen.

Avvertenza Il collegamento ISDN (Integrated Services Digital Network -Rete digitale a servizi integrati) viene considerato come una fonte di tensione che dovrebbe essere inaccessibile al contatto dell’utente. Gli utenti non devono manomettere o provare ad aprire le apparecchiature o i componenti di collegamento forniti dalla società telefonica. Qualsiasi collegamento cablato (ad eccezione di un conettore non rimovibile, da installare una sola volta) deve essere eseguito esclusivamente da un dipendente della società telefonica o da tecnici specializzati.

Advarsel ISDN-koblingen betraktes som en spenningskilde som bør være utilgjengelig for brukeren. Brukere bør ikke klusse med eller åpne utstyr eller tilkoblingsmateriale som er utstyrt av Telenor. Eventuelle faste installasjoner (bortsett fra koblinger som er foretatt med kabelsko for engangsbruk og som ikke kan fjernes) må kun utføres av Telenor-montører.

Aviso A conexão RDIS (Rede Digital com Integração de Serviços) é interpretada como uma fonte de tensão que deverá ser inacessível ao utilizador. Os utilizadores não deverão tentar violar qualquer equipamento ou conexão de serviço telefónico público. Qualquer conexão de rede de fios (para além da estabelecida por terminais não-removíveis de ligação única), deverá apenas ser efectuada por pessoal dos serviços telefónicos ou engenheiros devidamente treinados.

¡Advertencia! La conexión al circuito RDSI (Red Digital de Servicios Integrados) se considera como una fuente de voltaje con la cual el usuario no debe entrar en contacto. Los usuarios deberán evitar manipular indebidamente, o abrir, los equipos o hardware de conexión proporcionados por cualquier compañía operadora de la red pública de telefonía. Las conexiones de cable rígido que sean necesarias (excepto las de lengüeta no desmontable de un solo uso) deberán ser realizadas exclusivamente por personal de la entidad operadora de la red pública de telefonía, o por personal técnico adecuadamente capacitado.

Varning! ISDN-anslutningen betraktas som en spänningskälla och bör inte vara åtkomlig för användaren (ISDN: Integrated Services Digital Network = digitalt flertjänstnät). Användare får inte manipulera eller söka öppna utrustning eller anslutningsdon som tillhandahållits av telefonbolag (PTO-produkter). Anslutning av ledningar (med undantag av icke löstagbara kabelskor för engångsanslutning) får endast utföras av PTO-anställda eller lämpligt utbildade tekniker.

Qualified Personnel Warning

Warning Only trained and qualified personnel should be allowed to install or replace this equipment.

Waarschuwing Installatie en reparaties mogen uitsluitend door getraind en bevoegd personeel uitgevoerd worden.

Varoitus Ainoastaan koulutettu ja pätevä henkilökunta saa asentaa tai vaihtaa tämän laitteen.

Avertissement Tout installation ou remplacement de l'appareil doit être réalisé par du personnel qualifié et compétent.

Achtung Gerät nur von geschultem, qualifiziertem Personal installieren oder auswechseln lassen.

Avvertenza Solo personale addestrato e qualificato deve essere autorizzato ad installare o sostituire questo apparecchio.

Advarsel Kun kvalifisert personell med riktig opplæring bør montere eller bytte ut dette utstyret.

Aviso Este equipamento deverá ser instalado ou substituído apenas por pessoal devidamente treinado e qualificado.

¡Atención! Estos equipos deben ser instalados y reemplazados exclusivamente por personal técnico adecuadamente preparado y capacitado.

Varning Denna utrustning ska endast installeras och bytas ut av utbildad och kvalificerad personal.

Restricted Area Warning

Warning This unit is intended for installation in restricted access areas.

Waarschuwing Dit toestel is bedoeld voor installatie op plaatsen met beperkte toegang.

Varoitus Tämä laite on tarkoitettu asennettavaksi paikkaan, johon pääsy on rajoitettua.

Attention Cet appareil est à installer dans des zones d'accès réservé.

Warnung Diese Einheit ist zur Installation in Bereichen mit beschränktem Zutritt vorgesehen.

Avvertenza Questa unità deve essere installata in aree ad accesso limitato.

Advarsel Denne enheten er laget for installasjon i områder med begrenset adgang.

Aviso Esta unidade foi concebida para instalação em áreas de acesso restrito.

¡Advertencia! Esta unidad ha sido diseñada para instalarse en áreas de acceso restringido.

Varning! Denna enhet är avsedd för installation i områden med begränsat tillträde.

DC Power Disconnection Warning

Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position.

Waarschuwing Voordat u een van de onderstaande procedures uitvoert, dient u te controleren of de stroom naar het gelijkstroom circuit uitgeschakeld is. Om u ervan te verzekeren dat alle stroom UIT is geschakeld, kiest u op het schakelbord de stroomverbreker die het gelijkstroom circuit bedient, draait de stroomverbreker naar de UIT positie en plakt de schakelaarhendel van de stroomverbreker met plakband in de UIT positie vast.

Varoitus Varmista, että tasavirtapiirissä ei ole virtaa ennen seuraavien toimenpiteiden suorittamista. Varmistaaksesi, että virta on KATKAISTU täysin, paikanna tasavirrasta huolehtivassa kojetaulussa sijaitseva suojakytkin, käännä suojakytkin KATKAISTU-asentoon ja teippaa suojakytkimen varsi niin, että se pysyy KATKAISTU-asennossa.

Attention Avant de pratiquer l'une quelconque des procédures ci-dessous, vérifier que le circuit en courant continu n'est plus sous tension. Pour en être sûr, localiser le disjoncteur situé sur le panneau de service du circuit en courant continu, placer le disjoncteur en position fermée (OFF) et, à l'aide d'un ruban adhésif, bloquer la poignée du disjoncteur en position OFF.

Warnung Vor Ausführung der folgenden Vorgänge ist sicherzustellen, daß die Gleichstromschaltung keinen Strom erhält. Um sicherzustellen, daß sämtlicher Strom abgestellt ist, machen Sie auf der Schalttafel den Unterbrecher für die Gleichstromschaltung ausfindig, stellen Sie den Unterbrecher auf AUS, und kleben Sie den Schaltergriff des Unterbrechers mit Klebeband in der AUS-Stellung fest.

Avvertenza Prima di svolgere una qualsiasi delle procedure seguenti, verificare che il circuito CC non sia alimentato. Per verificare che tutta l’alimentazione sia scollegata (OFF), individuare l’interruttore automatico sul quadro strumenti che alimenta il circuito CC, mettere l’interruttore in posizione OFF e fissarlo con nastro adesivo in tale posizione.

Advarsel Før noen av disse prosedyrene utføres, kontroller at strømmen er frakoblet likestrømkretsen. Sørg for at all strøm er slått AV. Dette gjøres ved å lokalisere strømbryteren på brytertavlen som betjener likestrømkretsen, slå strømbryteren AV og teipe bryterhåndtaket på strømbryteren i AV-stilling.

Aviso Antes de executar um dos seguintes procedimentos, certifique-se que desligou a fonte de alimentação de energia do circuito de corrente contínua. Para se assegurar que toda a corrente foi DESLIGADA, localize o disjuntor no painel que serve o circuito de corrente contínua e coloque-o na posição OFF (Desligado), segurando nessa posição a manivela do interruptor do disjuntor com fita isoladora.

¡Advertencia! Antes de proceder con los siguientes pasos, comprobar que la alimentación del circuito de corriente continua (CC) esté cortada (OFF). Para asegurarse de que toda la alimentación esté cortada (OFF), localizar el interruptor automático en el panel que alimenta al circuito de corriente continua, cambiar el interruptor automático a la posición de Apagado (OFF), y sujetar con cinta la palanca del interruptor automático en posición de Apagado (OFF).

Varning! Innan du utför någon av följande procedurer måste du kontrollera att strömförsörjningen till likströmskretsen är bruten. Kontrollera att all strömförsörjning är BRUTEN genom att slå AV det överspänningsskydd som skyddar likströmskretsen och tejpa fast överspänningsskyddets omkopplare i FRÅN-läget.

DC Power Supply Wiring Warning

Warning The illustration shows the DC power supply terminal block. Wire the DC power supply using the appropriate lugs at the wiring end, as illustrated. The proper wiring sequence is ground to ground, positive to positive (line to L), and negative to negative (neutral to N). Note that the ground wire should always be connected first and disconnected last.

Waarschuwing De figuur toont de aansluitstrip van de gelijkstroomvoeding. Breng de bedrading aan voor de gelijkstroomvoeding met behulp van de juiste aansluitpunten aan het draadeinde zoals aangegeven. De juiste bedradingsvolgorde is aarde naar aarde, positief naar positief (lijn naar L) en negatief naar negatief (neutraal naar N). Let op dat de aarddraad altijd het eerst verbonden en het laatst losgemaakt wordt.

Varoitus Kuva esittää tasavirran pääterasiaa. Liitä tasavirtalähde johdon avulla käyttäen sopivia kiinnityskorvia johdon päässä kuvan esittämällä tavalla. Oikea kytkentäjärjestys on maajohto maajohtoon, positiivinen positiiviseen (johto L:ään) ja negatiivinen negatiiviseen (nollajohto N:ään). Ota huomioon, että maajohto on aina yhdistettävä ensin ja irrotettava viimeisenä.

Attention La figure illustre le bloc de connexion de l'alimentation en courant continu. Câbler l'alimentation en courant continu en fixant les cosses qui conviennent aux extrémités câblées conformément au schéma. La séquence de câblage à suivre est terre-terre, positif-positif (ligne sur L), et négatif-négatif (neutre sur N). Noter que le fil de masse doit toujours être connecté en premier et déconnecté en dernier.

Warnung Die Abbildung zeigt den Terminalblock des Gleichstrom-Netzgeräts. Verdrahten Sie das Gleichstrom-Netzgerät unter Verwendung von geeigneten Kabelschuhen am Verdrahtungsende (siehe Abbildung). Die richtige Verdrahtungsfolge ist Erde an Erde, positiv an positiv (Leitung an L) und negativ an negativ (neutral an N). Beachten Sie bitte, daß der Erdungsdraht immer als erster verbunden und als letzter abgetrennt werden sollte.

Avvertenza L'illustrazione mostra la morsettiera dell alimentatore CC. Cablare l'alimentatore CC usando i connettori adatti all'estremità del cablaggio, come illustrato. La corretta sequenza di cablaggio è da massa a massa, da positivo a positivo (da linea ad L) e da negativo a negativo (da neutro a N). Tenere presente che il filo di massa deve sempre venire collegato per primo e scollegato per ultimo.

Advarsel Figuren viser likestrømforsyningsenhetens tilkoplingsterminal. Likestrømforsyningsenheten tilkoples ved hjelp av passende kabelsko som festes i enden av ledningene, slik som vist i figuren. Riktig tilkoplingssekvens er jord til jord, positiv til positv (linje til L), og negativ til negativ (nøytral til N). Husk at jordingsledningen alltid bør tilkoples først og frakoples sist.

Aviso A figura mostra o bloco do terminal de fornecimento de corrente contínua. Ligue o fornecimento de corrente contínua utilizando as extremidades apropriadas no final do cabo, conforme ilustrado. A sequência correcta de instalação é terra-a-terra, positivo-positivo (linha para L), e negativo-negativo (neutro para N). Note que o fio de terra deverá ser sempre o primeiro a ser ligado, e o último a ser desligado.

¡Advertencia! La figura muestra la caja de bornes de la fuente de alimentación. Cablear la fuente de alimentación de corriente continua, usando las lengüetas de conexión apropiadas, en el extremo del cable tal como se muestra. Las conexiones deben realizarse en el siguiente orden: tierra con tierra, positivo con positivo (la línea con la L) y negativo con negativo (el neutro con la N). Tenga en cuenta que el conductor de tierra siempre tiene que conectarse el primero y desconectarse el último.

Varning! Illustrationen visar anslutningsplinten för likströmförsörjningsenheten. Koppla ledningarna till strömförsörjningsenheten med lämpliga kabelskor i ledningsändarna som bilden visar. Korrekt kopplingssekvens är jord till jord, positiv till positiv (linje till L) och negativ till negativ (neutral till N). Observera att jordledningen alltid skall anslutas först och kopplas bort sist.

DC Power Supply Warning

Warning When stranded wiring is required, use approved wiring terminations, such as closed-loop or spade-type with upturned lugs. These terminations should be the appropriate size for the wires and should clamp both the insulation and conductor.

Waarschuwing Wanneer geslagen bedrading vereist is, dient u bedrading te gebruiken die voorzien is van goedgekeurde aansluitingspunten, zoals het gesloten-lus type of het grijperschop type waarbij de aansluitpunten omhoog wijzen. Deze aansluitpunten dienen de juiste maat voor de draden te hebben en dienen zowel de isolatie als de geleider vast te klemmen.

Varoitus Jos säikeellinen johdin on tarpeen, käytä hyväksyttyä johdinliitäntää, esimerkiksi suljettua silmukkaa tai kourumaista liitäntää, jossa on ylöspäin käännetyt kiinnityskorvat. Tällaisten liitäntöjen tulee olla kooltaan johtimiin sopivia ja niiden tulee puristaa yhteen sekä eristeen että johdinosan.

Attention Quand des fils torsadés sont nécessaires, utiliser des douilles terminales homologuées telles que celles à circuit fermé ou du type à plage ouverte avec cosses rebroussées. Ces douilles terminales doivent être de la taille qui convient aux fils et doivent être refermées sur la gaine isolante et sur le conducteur.

Warnung Wenn Litzenverdrahtung erforderlich ist, sind zugelassene Verdrahtungsabschlüsse, z.B. für einen geschlossenen Regelkreis oder gabelförmig, mit nach oben gerichteten Kabelschuhen zu verwenden. Diese Abschlüsse sollten die angemessene Größe für die Drähte haben und sowohl die Isolierung als auch den Leiter festklemmen.

Avvertenza Quando occorre usare trecce, usare connettori omologati, come quelli a occhiello o a forcella con linguette rivolte verso l’alto. I connettori devono avere la misura adatta per il cablaggio e devono serrare sia l’isolante che il conduttore.

Advarsel Hvis det er nødvendig med flertrådede ledninger, brukes godkjente ledningsavslutninger, som for eksempel lukket sløyfe eller spadetype med oppoverbøyde kabelsko. Disse avslutningene skal ha riktig størrelse i forhold til ledningene, og skal klemme sammen både isolasjonen og lederen.

Aviso Quando forem requeridas montagens de instalação eléctrica de cabo torcido, use terminações de cabo aprovadas, tais como, terminações de cabo em circuito fechado e planas com terminais de orelha voltados para cima. Estas terminações de cabo deverão ser do tamanho apropriado para os respectivos cabos, e deverão prender simultaneamente o isolamento e o fio condutor.

¡Advertencia! Cuando se necesite hilo trenzado, utilizar terminales para cables homologados, tales como las de tipo "bucle cerrado" o "espada", con las lengüetas de conexión vueltas hacia arriba. Estos terminales deberán ser del tamaño apropiado para los cables que se utilicen, y tendrán que sujetar tanto el aislante como el conductor.

Varning! När flertrådiga ledningar krävs måste godkända ledningskontakter användas, t.ex. kabelsko av sluten eller öppen typ med uppåtvänd tapp. Storleken på dessa kontakter måste vara avpassad till ledningarna och måste kunna hålla både isoleringen och ledaren fastklämda.

DC Power Connection Warning

Warning After wiring the DC power supply, remove the tape from the circuit breaker switch handle and reinstate power by moving the handle of the circuit breaker to the ON position.

Waarschuwing Nadat de bedrading van de gelijkstroom voeding aangebracht is, verwijdert u het plakband van de schakelaarhendel van de stroomverbreker en schakelt de stroom weer in door de hendel van de stroomverbreker naar de AAN positie te draaien.

Varoitus Yhdistettyäsi tasavirtalähteen johdon avulla poista teippi suojakytkimen varresta ja kytke virta uudestaan kääntämällä suojakytkimen varsi KYTKETTY-asentoon.

Attention Une fois l'alimentation connectée, retirer le ruban adhésif servant à bloquer la poignée du disjoncteur et rétablir l'alimentation en plaçant cette poignée en position de marche (ON).

Warnung Nach Verdrahtung des Gleichstrom-Netzgeräts entfernen Sie das Klebeband vom Schaltergriff des Unterbrechers und schalten den Strom erneut ein, indem Sie den Griff des Unterbrechers auf EIN stellen.

Avvertenza Dopo aver eseguito il cablaggio dell’alimentatore CC, togliere il nastro adesivo dall’interruttore automatico e ristabilire l’alimentazione spostando all'interruttore automatico in posizione ON.

Advarsel Etter at likestrømsenheten er tilkoblet, fjernes teipen fra håndtaket på strømbryteren, og deretter aktiveres strømmen ved å dreie håndtaket på strømbryteren til PÅ-stilling.

Aviso Depois de ligar o sistema de fornecimento de corrente contínua, retire a fita isoladora da manivela do disjuntor, e volte a ligar a corrente ao deslocar a manivela para a posição ON (Ligado).

¡Advertencia! Después de cablear la fuente de alimentación de corriente continua, retirar la cinta de la palanca del interruptor automático, y restablecer la alimentación cambiando la palanca a la posición de Encendido (ON).

Varning! När du har kopplat ledningarna till strömförsörjningsenheten för inmatad likström tar du bort tejpen från överspänningsskyddets omkopplare och slår på strömmen igen genom att ställa överspänningsskyddets omkopplare i TILL-läget.

Lightning Activity Warning

Warning Do not work on the system or connect or disconnect cables during periods of lightning activity.

Waarschuwing Tijdens onweer dat gepaard gaat met bliksem, dient u niet aan het systeem te werken of kabels aan te sluiten of te ontkoppelen.

Varoitus Älä työskentele järjestelmän parissa äläkä yhdistä tai irrota kaapeleita ukkosilmalla.

Attention Ne pas travailler sur le système ni brancher ou débrancher les câbles pendant un orage.

Warnung Arbeiten Sie nicht am System und schließen Sie keine Kabel an bzw. trennen Sie keine ab, wenn es gewittert.

Avvertenza Non lavorare sul sistema o collegare oppure scollegare i cavi durante un temporale con fulmini.

Advarsel Utfør aldri arbeid på systemet, eller koble kabler til eller fra systemet når det tordner eller lyner.

Aviso Não trabalhe no sistema ou ligue e desligue cabos durante períodos de mau tempo (trovoada).

¡Advertencia! No operar el sistema ni conectar o desconectar cables durante el transcurso de descargas eléctricas en la atmósfera.

Varning! Vid åska skall du aldrig utföra arbete på systemet eller ansluta eller koppla loss kablar.

Grounded Equipment Warning

Warning This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.

Waarschuwing Deze apparatuur hoort geaard te worden Zorg dat de host-computer tijdens normaal gebruik met aarde is verbonden.

Varoitus Tämä laitteisto on tarkoitettu maadoitettavaksi. Varmista, että isäntälaite on yhdistetty maahan normaalikäytön aikana.

Attention Cet équipement doit être relié à la terre. S'assurer que l'appareil hôte est relié à la terre lors de l'utilisation normale.

Warnung Dieses Gerät muß geerdet werden. Stellen Sie sicher, daß das Host-Gerät während des normalen Betriebs an Erde gelegt ist.

Avvertenza Questa apparecchiatura deve essere collegata a massa. Accertarsi che il dispositivo host sia collegato alla massa di terra durante il normale utilizzo.

Advarsel Dette utstyret skal jordes. Forviss deg om vertsterminalen er jordet ved normalt bruk.

Aviso Este equipamento deverá estar ligado à terra. Certifique-se que o host se encontra ligado à terra durante a sua utilização normal.

¡Advertencia! Este equipo debe conectarse a tierra. Asegurarse de que el equipo principal esté conectado a tierra durante el uso normal.

Varning! Denna utrustning är avsedd att jordas. Se till att värdenheten är jordad vid normal användning.

Power Supply Disconnection Warning

Warning Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.

Waarschuwing Voordat u aan een frame of in de nabijheid van voedingen werkt, dient u bij wisselstroom toestellen de stekker van het netsnoer uit het stopcontact te halen; voor gelijkstroom toestellen dient u de stroom uit te schakelen bij de stroomverbreker.

Varoitus Kytke irti vaihtovirtalaitteiden virtajohto ja katkaise tasavirtalaitteiden virta suojakytkimellä, ennen kuin teet mitään asennuspohjalle tai työskentelet virtalähteiden läheisyydessä.

Attention Avant de travailler sur un châssis ou à proximité d'une alimentation électrique, débrancher le cordon d'alimentation des unités en courant alternatif ; couper l'alimentation des unités en courant continu au niveau du disjoncteur.

Warnung Bevor Sie an einem Chassis oder in der Nähe von Netzgeräten arbeiten, ziehen Sie bei Wechselstromeinheiten das Netzkabel ab bzw. schalten Sie bei Gleichstromeinheiten den Strom am Unterbrecher ab.

Avvertenza Prima di lavorare su un telaio o intorno ad alimentatori, scollegare il cavo di alimentazione sulle unità CA; scollegare l'alimentazione all’interruttore automatico sulle unità CC.

Advarsel Før det utføres arbeid på kabinettet eller det arbeides i nærheten av str¿mforsyningsenheter, skal str¿mledningen trekkes ut pŒ vekselstrømsenheter og strømmen kobles fra ved strømbryteren på likestrømsenheter.

Aviso Antes de trabalhar num chassis, ou antes de trabalhar perto de unidades de fornecimento de energia, desligue o cabo de alimentação nas unidades de corrente alternada; desligue a corrente no disjuntor nas unidades de corrente contínua.

¡Advertencia! Antes de manipular el chasis de un equipo o trabajar cerca de una fuente de alimentación, desenchufar el cable de alimentación en los equipos de corriente alterna (CA); cortar la alimentación desde el interruptor automático en los equipos de corriente continua (CC).

Varning! **I**nnan du arbetar med ett chassi eller nära strömförsörjningsenheter skall du för växelströmsenheter dra ur nätsladden och för likströmsenheter bryta strömmen vid överspänningsskyddet.

Power Supply Warning

Warning Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is OFF and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected.

Waarschuwing U dient de voeding niet aan te raken zolang het netsnoer aangesloten is. Bij systemen met een stroomschakelaar zijn er lijnspanningen aanwezig in de voeding, zelfs wanneer de stroomschakelaar uitgeschakeld is en het netsnoer aangesloten is. Bij systemen zonder een stroomschakelaar zijn er lijnspanningen aanwezig in de voeding wanneer het netsnoer aangesloten is.

Varoitus Älä kosketa virtalähdettä virtajohdon ollessa kytkettynä. Virrankatkaisimella varustetuissa järjestelmissä on virtalähteen sisällä jäljellä verkkojännite, vaikka virrankatkaisin on katkaistu-asennossa virtajohdon ollessa kytkettynä. Järjestelmissä, joissa ei ole virrankatkaisinta, on virtalähteen sisällä verkkojännite, kun virtajohto on kytkettynä.

Attention Ne pas toucher le bloc d'alimentation quand le cordon d'alimentation est branché. Avec les systèmes munis d'un commutateur marche-arrêt, des tensions de ligne sont présentes dans l'alimentation quand le cordon est branché, même si le commutateur est à l'arrêt. Avec les systèmes sans commutateur marche-arrêt, l'alimentation est sous tension quand le cordon d'alimentation est branché.

Warnung Berühren Sie das Netzgerät nicht, wenn das Netzkabel angeschlossen ist. Bei Systemen mit Netzschalter liegen Leitungsspannungen im Netzgerät vor, wenn das Netzkabel angeschlossen ist, auch wenn das System ausgeschaltet ist. Bei Systemen ohne Netzschalter liegen Leitungsspannungen im Netzgerät vor, wenn das Netzkabel angeschlossen ist.

Avvertenza Non toccare l’alimentatore se il cavo dell’alimentazione è collegato. Per i sistemi con un interruttore di alimentazione, tensioni di linea sono presenti all’interno dell’alimentatore anche quando l’interruttore di alimentazione è en posizione di disattivazione (off), se il cavo dell’alimentazione è collegato. Per i sistemi senza un interruttore, tensioni di linea sono presenti all’interno dell’alimentatore quando il cavo di alimentazione è collegato.

Advarsel Berør ikke strømforsyningsenheten når strømledningen er tilkoblet. I systemer som har en strømbryter, er det spenning i strømforsyningsenheten selv om strømbryteren er slått av og strømledningen er tilkoblet. Når det gjelder systemer uten en strømbryter, er det spenning i strømforsyningsenheten når strømledingen er tilkoblet.

Aviso Não toque na unidade abastecedora de energia quando o cabo de alimentação estiver ligado. Em sistemas com interruptor, a corrente eléctrica estará presente na unidade abastecedora, sempre que o cabo de alimentação de energia estiver ligado, mesmo quando o interruptor se encontrar desligado. Para sistemas sem interruptor, a tensão eléctrica dentro da unidade abastecedora só estará presente quando o cabo de alimentação estiver ligado.

¡Advertencia! No tocar la fuente de alimentación mientras el cable esté enchufado. En sistemas con interruptor de alimentación, hay voltajes de línea dentro de la fuente, incluso cuando el interruptor esté en Apagado (OFF) y el cable de alimentación enchufado. En sistemas sin interruptor de alimentación, hay voltajes de línea en la fuente cuando el cable está enchufado.

Varning! Vidrör inte strömförsörjningsenheten när nätsladden är ansluten. För system med strömbrytare finns det nätspänning i strömförsörjningsenheten även när strömmen har slagits av men nätsladden är ansluten. För system utan strömbrytare finns det nätspänning i strömförsörjningsenheten när nätsladden är ansluten.

Chassis Warning—Disconnecting Telephone-Network Cables

Warning Before opening the chassis, disconnect the telephone-network cables to avoid contact with telephone-network voltages.

Waarschuwing Voordat u het frame opent, dient u de verbinding met het telefoonnetwerk te verbreken door de kabels te ontkoppelen om zo contact met telefoonnetwerk-spanningen te vermijden.

Varoitus Vältä joutumista kosketuksiin puhelinverkostojännitteiden kanssa irrottamalla puhelinverkoston kaapelit ennen asennuspohjan aukaisemista.

Attention Avant d'ouvrir le châssis, débrancher les câbles du réseau téléphonique afin d'éviter tout contact avec les tensions d'alimentation du réseau téléphonique.

Warnung Bevor Sie das Chassis öffnen, ziehen Sie die Telefonnetzkabel aus der Verbindung, um Kontakt mit Telefonnetzspannungen zu vermeiden.

Avvertenza Prima di aprire il telaio, scollegare i cavi della rete telefonica per evitare di entrare in contatto con la tensione di rete.

Advarsel Før kabinettet åpnes, skal kablene for telenettet kobles fra for å unngå å komme i kontakt med spenningen i telenettet.

Aviso Antes de abrir o chassis, desligue os cabos da rede telefónica para evitar contacto com a tensão da respectiva rede.

¡Advertencia! Antes de abrir el chasis, desconectar el cableado dirigido a la red telefónica para evitar contacto con voltajes de la propia red.

Varning! Koppla loss ledningarna till telefonnätet innan du öppnar chassit så att kontakten med telefonnätsspänningen bryts.